

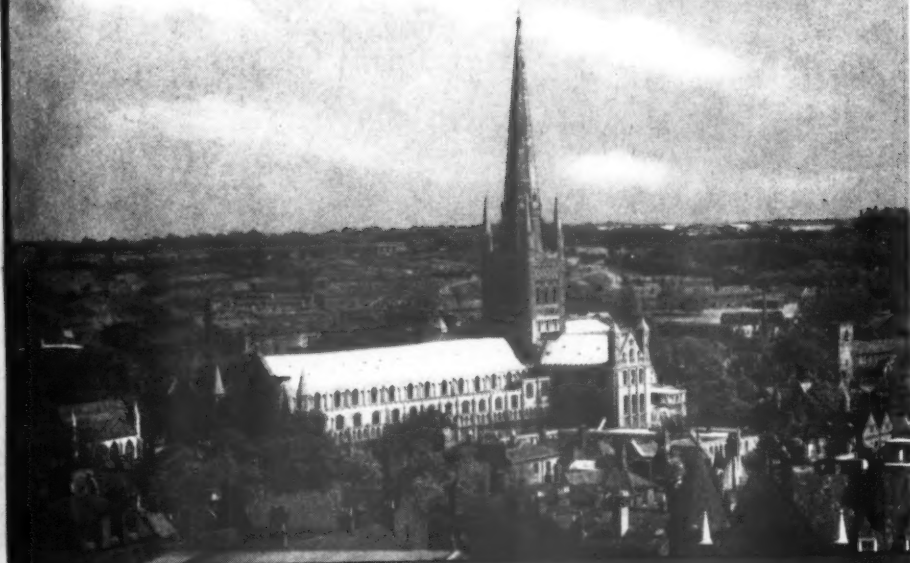
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July 1957

Agriculture

Volume LXIV Number 4

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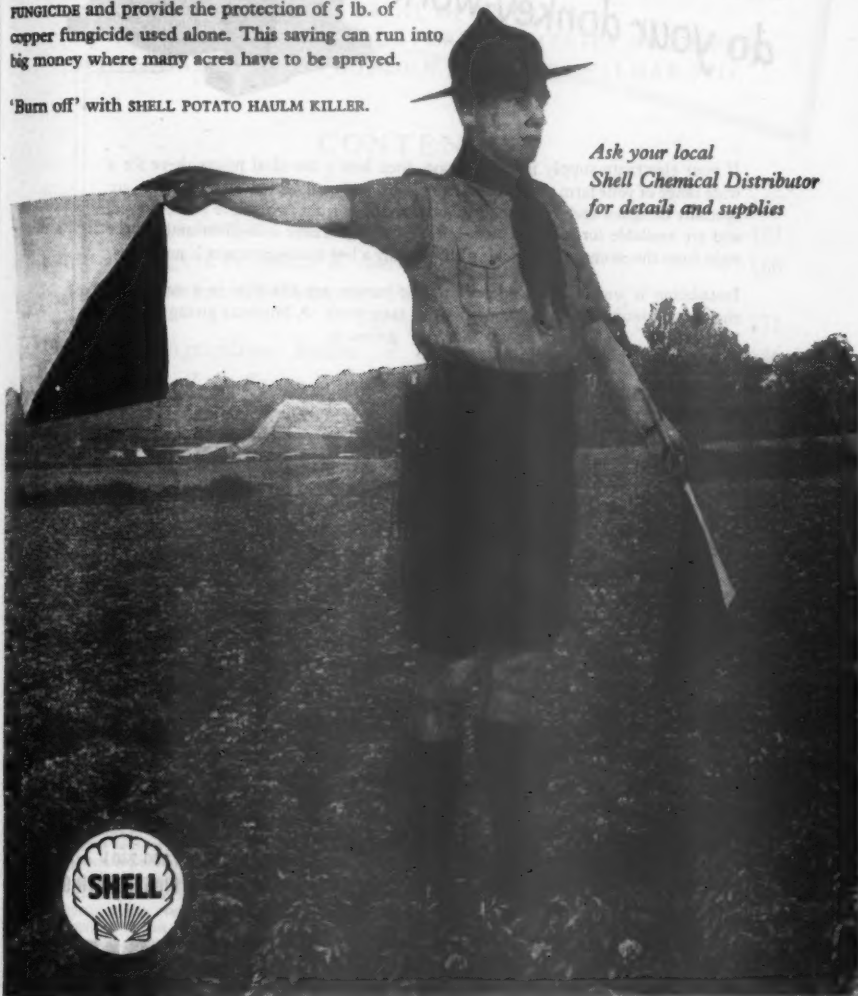
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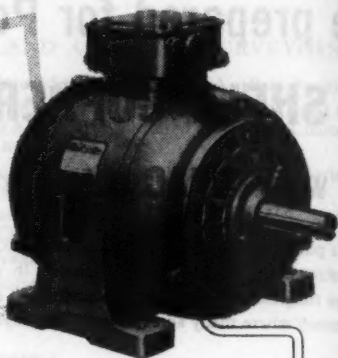
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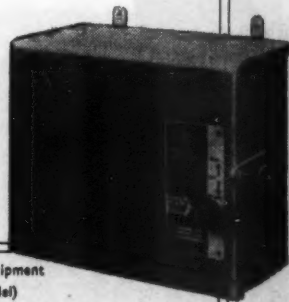
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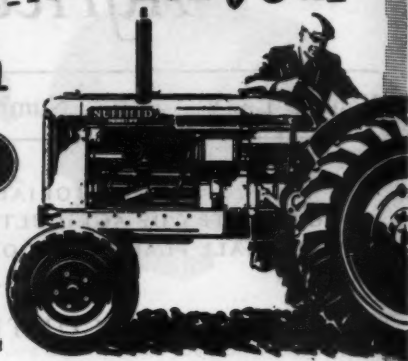
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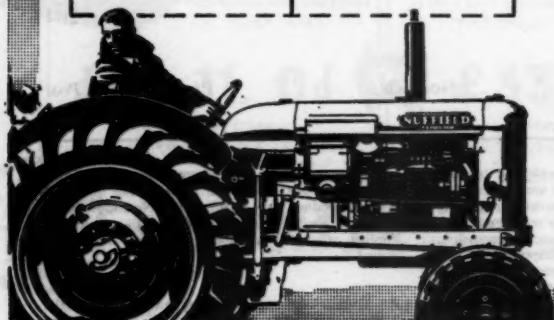
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Farming in Norfolk

A. L. MITCHELL

With its dry and warm climate, East Anglia is the great arable area of Britain, and here in Norfolk the fertile farms testify to centuries of consolidated good husbandry.

"ALL England may be carved out of Norfolk", wrote that industrious seventeenth-century scholar, Dr. Thomas Fuller. This summing up of the county's soil types has been applied by later writers to its farming with less exaggeration than those unfamiliar with it might imagine.

Certainly one of the most striking characteristics of Norfolk agriculture is its diversity. There are few British crops or forms of livestock husbandry that cannot be found on a major scale within its borders. To some extent, of course, this is a direct reflection of soil variations, which range from rich silts and deep loams to medium clays and blowing sand. A large proportion of its most productive land is a distinctly light loam which, while it has the advantage of being easy to work, would be regarded in some parts of the country with no great enthusiasm. And then there is the black fen in the south-west of the county . . . a remote region with a highly specialized system of husbandry and a population reputed to have developed webbed feet as a result of centuries of battling against floods!

Different soils not only often beget different farming systems but they also leave their mark on the people who live by them. Although people from all parts of Norfolk have certain qualities in common—among them, a firm independence—the populations of the different regions of the county have distinct characters of their own. A North Norfolk man in Breckland or a man from the Eastern plain in the fens is a stranger in a strange land.

In other parts of Britain there is a strong tendency to regard Norfolk as mainly a county of big farms, but in point of fact there is as great a diversity in size of holdings as in the pattern of their enterprises. True, large-scale farming has a major place in the county; the 6 per cent of its holdings that exceed 300 acres accounts for nearly half the land. But 75 per cent of Norfolk farms are of less than 100 acres, and there are five thousand holdings of no more than 10 acres.

Norfolk County Council has a bigger smallholdings estate than any other authority of its kind in the country. These holdings, totalling over 32,000 acres, are distributed over almost every type of soil, and among them is represented virtually every kind of farming practised on the larger holdings in the county.

The bigger farms of Norfolk are mainly to be found on the lighter lands. Thus, on the coarse, sandy loam of the north-west, covering about one-seventh of the county, just over 60 per cent of the land is in farms of more than 500 acres. This is probably the most highly mechanized farming region of its size in Britain. In contrast, on the rich silt lands bordering the Wash, 60 per cent of the land is in units of under 200 acres.

Mainly arable farming

Norfolk's climate, perhaps even more than its soils, has dictated that its farming should be predominantly arable. Although there have been times when the temptation to put more land down to grass has been strong, faith in the plough has never really faltered. Two or three years ago, when the tillage acreage of England and Wales was declining, Norfolk was increasing its arable. Out of just over a million acres of farm land in the county, 800,000 acres are devoted to arable crops, of which more than half are cereals.

Beef, finished in yards, and barley were the traditional mainstays of the system, with sheep as a valuable adjunct. Today only barley retains its old importance. Indeed it is probably more important now than it was in the days of Coke, for since then most farms have introduced a second barley crop into the rotation. The greater part of Norfolk is ideally suited to this crop, and for many years it has consistently occupied between a fifth and a quarter of the county's total agricultural acreage. Last season, 244,000 acres of barley were grown in Norfolk—11.5 per cent of the national crop.

Within the last decade there has been a marked expansion in the Norfolk wheat acreage, thanks to the introduction of short-strawed varieties which can withstand generous manuring. High yields are now being obtained from such varieties on land which previously had never been regarded as even remotely suitable for this cereal. During the war, when cropping directions were in force, 100,000 acres of wheat was as much as the Ministry thought fit to ask of Norfolk; but last year this old target was exceeded by nearly 50 per cent. Oats, for which most of the county is less suited, are grown almost entirely for feeding to stock and normally amount to no more than about 60,000 acres—some 8 per cent of the total arable.

Despite its low rainfall and predominantly light land, Norfolk has been famous for its root crops ever since Townshend encouraged turnip-growing. It was here that the British sugar beet industry had its beginnings, and for more than a quarter of a century this crop has been the pivot of most rotations in the county. Occupying close on 100,000 acres—almost a quarter of the total for England and Wales—it is cultivated on every type of soil, from the lightest sands to the clays. Not only has it the attraction of being a crop that is grown on contract, but the tops provide valuable feed for dairy cows, fattening bullocks and sheep from late September until January. Last season the British Sugar Corporation's three Norfolk factories (at Cantley, King's Lynn and Wisington) dealt with a total of 1,143,000 tons of beet—a record average of 13½ tons an acre.

Potatoes have a very important place in many parts of the county—notably the silts, the black fens and the deep loams—although on the lighter lands the acreage has declined considerably since the war.

Vegetables figure prominently among field crops in nearly every part of Norfolk. This type of crop, which is traditional on the silts and the black fens, began to appear on the lighter lands during the depression of the 1930s, and it became thoroughly established there during the Second World War. In the last decade the acreage devoted to vegetables in the county has been far greater than that under potatoes and almost half that given over to sugar beet.

Carrots, accounting for one-fifth of the total vegetable acreage, have now

been overtaken by peas for canning and quick-freezing, the production of which has been one of the main developments in Norfolk arable husbandry in recent years. Over 12,000 acres of peas for vining are grown in the county, on a wide variety of soils, besides some 10,000 acres that are dried in the field and sold to processors. One of the great virtues of this crop is that it provides a break from cereals in rotations which in many cases were tending to become too narrow.

Progress with grass

Hard things are sometimes said by farmers in the Midlands and the west of the country about Norfolk's grassland. Time was when the general standard of grass production here did leave a good deal to be desired; and this was by no means always the fault of the farmer. But in the last ten or fifteen years a great deal of progress has been made in this branch of husbandry in the county, partly as a result of new techniques and partly through the development of new strains of herbage seeds. On many Norfolk farms today, despite the fact that the county has an average rainfall of only about 25 inches, pastures can be found that are quite up to the average of those in parts of Britain which have a climate much better suited to this crop. In some parts of Norfolk, commercial grass- and lucerne-drying has become an important industry; in fact, the county has the biggest commercial green crop-drying plant in the United Kingdom.

Ley farming, in the accepted sense of the term, is not practised to any great extent in Norfolk. In general, in this part of the country it does not pay to keep fields under grass for longer than is necessary to preserve a good rotation and maintain the physical structure of the soil. Thus about half the county's 100,000 acres of ley is normally kept down for no more than one year. There is, however, just over 200,000 acres of permanent pasture, by far the greater part of which consists of low meadows or marsh grazings that do not lend themselves to arable cropping.

Rise of the dairy cow

The past fifty years have seen a revolution in Norfolk livestock farming. Sheep, whose numbers in the county once ran to nearly a million, lost some of their importance with the development of the fertilizer industry and were finally reduced to relatively humble status by heavy imports of cheap lamb and mutton.

Not long afterwards, also because of foreign competition, farmers were compelled to seek an alternative to the yarded bullock. They found it in the dairy cow which, while not so valuable in its contribution to soil fertility, has at least provided greater stability in returns. The rise in dairying has been one of the most striking developments in Norfolk agriculture in modern times—probably equalled only by the introduction of sugar beet. In this change, no small part was played by the migration to Norfolk of farmers from Scotland—some of whom were anxious to escape from dairying but soon found that if they were to succeed they would have to return to it.

From the start the emphasis has been on winter production, which fits in well with Norfolk farming, since the residues of arable crops provide a

substantial part of the herd's requirements in what for most other counties are the most difficult months. Since 1939, the county's milk output has almost doubled. It has now some 2,400 dairy herds, of which 736 are officially recorded, with a total of 75,000 cows and heifers in milk or in calf. For a number of years, yields from recorded herds in Norfolk have been the highest in the Milk Marketing Board's eastern region.

In the last ten years there has been a great increase in pedigree breeding of dairy cattle in the county, and animals from Norfolk herds of a number of breeds have figured in the honours lists at national shows.

Other livestock aspects

Beef production, of course, has never been completely ousted, although there have been long periods when its devotees had little to show for their labours and capital investment except a pile of manure and the satisfaction which most Norfolk men get from seeing a nicely finished bullock. The last few years, however, have seen a renewed interest in this branch of production, although there is much greater variation of method than was the case in the old days. Some Norfolk farmers have established beef-breeding herds; a number have turned to rearing calves bought from other sources; but the majority still prefer to buy the forward store.

There has been a mild revival of interest in sheep in recent years and the population of this class of livestock in Norfolk now approaches the 60,000 mark. There is little possibility, however, of a return to sheep on a really big scale, and certainly no likelihood of a return to close-folding.

Another notable feature of Norfolk livestock farming is the expansion of the poultry industry, the value of whose products now comes second only to milk and is 25 per cent higher than the combined total for beef and sheep. Every branch of poultry production is represented in the county. There has been a spectacular development of the old-established duck-fattening industry, which is now producing some 29 per cent of the country's home-killed supplies. Turkey breeding and fattening—another Norfolk speciality—has also made big strides.

Pigs, while not quite so prominent a part of the pattern as in the neighbouring county of Suffolk, nevertheless have an important place, ranking next to poultry as a source of farm income.

No one who becomes acquainted with Norfolk agriculture can fail to be profoundly impressed by its vitality—a quality that manifests itself in every form and scale of enterprise, and which is no less apparent in the ancillary industries. The intense interest—and “intense” is not too strong a word—that is taken in scientific and technical developments is part of the county's tradition. Since the days of the great Norfolk pioneers of modern British agriculture, there has been a virtually unbroken record of research and experiment by farmers in the county, either as individuals or collectively.

Horticulture in Norfolk

R. W. KEMP, N.D.H.

National Agricultural Advisory Service, Norfolk

Norfolk supplies a considerable proportion of the total market-garden and soft fruit produce of England, and the development of the canning and quick-freeze industries has encouraged growers to increase their acreages and output.

NORFOLK is often considered one of the "younger" counties so far as commercial horticulture is concerned. True, the pattern of the industry has changed considerably in the last fifty years (perhaps even more so in the last decade), but its traditions are in fact much older than many people realize. For example, there are records of orchards and cider-making at Banham near Attleborough dating back to 1281, and one of the firms still making cider in that neighbourhood can trace its history over more than 250 years. Another link with the past is Norwich market place, which has been used for the sale of provisions for over 700 years. Originally established, no doubt, for the sale of country produce, at the present time fruit, flower and vegetable products predominate.

Many of the small orchards and market gardens of a century and more ago, situated in and around the main areas of population, have disappeared in the last fifty years—most of them being ousted by housing estates and factories for light industries.

But despite this and the developments in large-scale, mechanized production of fruit and vegetables, there are still many small market gardeners growing all kinds of horticultural crops. Most of this produce goes to supply the local markets, including some direct sales to shops in Norwich, King's Lynn, Great Yarmouth and various small towns and holiday resorts.

Some of the pioneers

Amongst the men who have left their mark on Norfolk horticulture, and in some cases on the industry further afield, should be mentioned J. Cockett who, in the 1850s, planted one of the first commercial orchards in the Wisbech area. In East Norfolk two of the pioneers were Colonel B. J. Petre and "Squire" Cubitt, who started orchards at Westwick and Honing respectively towards the end of the nineteenth century. Coupled with the name of Colonel Petre should be that of Mr. George Davison who, in co-operation with his employer, raised many excellent varieties of black currants, notably Westwick Choice, W. Triumph and Davison's Eight. In the glasshouse sphere, there was Robert Holmes of Tuckswood, a pioneer over sixty years ago of glasshouse soil sterilizing and a raiser of many tomato varieties. Probably the best known of these was Potentate, which he raised round about 1910 from a cross (Sutton's Winter Beauty \times Holmes Ideal) suggested by the late Mr. James Tate of Great Plumstead.

HORTICULTURE IN NORFOLK

Flower growers have a Norfolk nurseryman, Horace Read of Brundall, to thank for several introductions, including the well-known chrysanthemum maximum varieties, Esther Read and Jennifer Read. Although locally regarded as something of a mystic, Horace Read was a skilled horticulturist and his plant introductions brought him world-wide recognition.

To pick just one more personality, we might recall the Potter Heigham schoolmaster Mr. F. Goldsmith who, in 1911, formed the Potter Heigham Fruit Growers' Association and started packing and marketing soft fruits, mainly black currants and raspberries, for local growers. Retired from teaching in 1925, he continued his work for the Association, sending fruit to markets all over the country, until 1942. Then, with no suitable successor available, the organization was wound up after thirty years' successful trading. Most of the members transferred to the East Norfolk Fruit Growers' Association which, in turn, was later renamed the Norfolk Fruit Growers' Association, the title by which it is known today.

Fruit linked with soil type

In 1951, Dr. Menzies Kitchin¹ described the extent of agricultural and horticultural production in the Eastern Counties and showed broadly how the farming was linked with soil types. At that time it was shown that no less than 41 per cent of the market-garden crops, nearly half of the black currants and over half the strawberries produced in England and Wales were being grown in this area. Norfolk's individual contribution to the country's fruit production is considerable, as is shown by the following table.

TABLE 1
Fruit acreages

	Norfolk <i>acres</i>	England and Wales <i>acres</i>
Strawberries	3,718	16,694
Raspberries	291	2,762
Black currants	2,264	10,436
Red and white currants	112	900
Gooseberries	790	5,633
Cultivated blackberries	108	1,221
Total Soft Fruit	7,283	37,646
Orchards	9,337	258,138

(Table based on 4th June 1956 returns)

As with the rest of the country, these figures are rather lower than they were five years or so ago. During this time 1,000 acres of orchards, mainly cooking apples and the cheaper varieties of plums, have been grubbed up owing to falling demand. Similarly, some soft fruit acreages fell, but black currants and strawberries are now beginning to recover. Distribution of these fruit crops within the county is closely linked with soil types, and there are some clear-cut distinctions in practices between one district and another.

Firstly, there is the well-known "Wisbech district", two-thirds of which actually lies in West Norfolk. Here the soil is a deep alluvial silt, most of it well drained yet having an abundant supply of moisture throughout the

growing season. The orchards, consisting basically of Bramleys, with other cooking apples and plums, lie cheek by jowl in great concentrations, separated from one another only by wide dykes. The low-spreading type of Bramley trees, product of the 1920s when all the tops had to be cut out because capsid was so rife and spraying machines were not powerful enough to get spray up to high branches, can still be seen. The more progressive growers are, however, giving their trees a little more freedom these days, and the close-spurred, weeping branches are not seen quite so often. Other changes since the Second World War have included more planting of dessert apples, with results which, helped in some cases by grassing down, have confounded many critics who expected dessert fruit to grow too large and fail to colour on such fertile soil. Pears, too, have been proving highly successful in this district. Indeed, entries in Conference Pear classes at Wisbech Commercial Show in recent years have been the most numerous for any show in the country.

Elsewhere in the county orchards are very much more scattered, the older ones being enterprises attached to large estates, though several of the younger plantings take the form of self-contained fruit farms. The late Mr. F. Goldsmith of Potter Heigham, writing in 1940³, recalled that when he first came to East Norfolk in 1895 after living in the Medway Valley "the paucity of fruit struck me forcibly". Even today, the casual visitor might think there was very little grown, but it is there in plenty if one gets a little way off the beaten track.

Most of the earlier plantings such as those at Westwick, Honing, Hoveton and Wattlefield were planned on similar lines to those of Wisbech, with cooking apples (especially Bramleys) and plums predominating. All these were extended between the two world wars and, like most of the new farms planted at that time and again since 1946, the emphasis was on dessert apples, mainly Cox, or Conference pears. An orchard which always arouses a great deal of interest is one planted at Roughton in the 1930s, where 42 acres, about a third of the farm, were planted as cordons. This has been claimed as being the largest plantation of its kind in the world.

The best of these earlier orchards were planted on good loamy soil or brickearth, over sandy clay loam subsoils. When interest first began to develop in dessert apples, it was said that Cox's could be grown successfully only on light soils. Unfortunately, some growers took this dictum too literally, and in a few cases quite unsuitable land was used, resulting in stunted trees displaying all manner of mineral deficiencies and drought symptoms. Such cases were not numerous, and most were cleared up in the food production drive during the war.

Soft fruit

Distribution of soft fruit crops and the intensity with which they are cultivated shows some very clear-cut distinctions allied to soil types. Thus two-thirds of the strawberries are grown on the deep silt soils of West Norfolk and the Wisbech area, and a similar proportion of the black currants are grown in East Norfolk. The bulk of these are found on the deep, loamy soils north of the River Yare and east of a line from Cromer to Norwich. In both cases soil depth and moisture-holding capacity are important factors.

As with black currants and strawberries, the largest acreages of gooseberries and raspberries are found at opposite ends of the county. Gooseberries are grown most extensively in West Norfolk, having been planted in large quantities in the apple and plum orchards in the Wisbech district. Raspberries have always been a popular crop in the Blofield/Lingwood area east of Norwich, and throughout the "Fleggs",* generally as an under-crop in the orchards on the mixed market gardens which abound in that area. For many years the main varieties grown were Norfolk Giant and Norwich Market, both locally-raised seedlings but these have now been displaced by the Malling varieties.

Huxley strawberries (known locally as Brenda's), Careless gooseberries and Baldwin, Westwick Choice and Wellington XXX black currants are the varieties of soft fruits mostly grown; though in the case of strawberries, Climax was a strong rival to Huxley while it lasted, and most other promising varieties have been, or are being, given extensive trials.

Apart from apples and the better quality plums, only comparatively small quantities of Norfolk fruit go to the fresh fruit market these days. The bulk is sold—usually on seasonal contracts—for processing by jam-makers, canners, quick-freezers and allied users. Recent developments in manufacturing fruit juices and long-term, five- or ten-year contracts, are interesting black currant growers.

The commercial fruit plantations on the Royal Estate at Sandringham consist of some 56 acres of dessert apples and about 13 acres of black currants. A modern packing shed and cold stores have recently been added for handling and storing the fruit.

Vegetables for canning and quick-freezing

Vegetable growing on the scale indicated in Table 2 is no longer a market garden occupation and, for a great many years, several of the more easily managed crops have been grown by farmers as part of their ordinary rotation. The disappearance of many long-established market garden areas and the taking up of vegetable growing by farmers in new areas was well described in 1943 by P. E. Cross¹. In Norfolk, there have been two or three distinct stages in this development. Firstly, farmers were already growing some "vegetables" (cabbages, peas, turnips and carrots, etc.) primarily no doubt for stock feed, at least as far back as the end of the eighteenth century².

By the end of the 1914-18 war they were changing over to better varieties, particularly of cabbages, which had a dual purpose—either for marketing or stock feeding—and this was further encouraged by expansion in the canning industry in the 1930s.

There was then the enforced expansion to meet the need for food in the Second World War, and since 1946 there have been even more spectacular changes with the coming into the area of quick-freezing interests. Very large acreages are now being devoted to vining peas, broad beans, french and runner beans, sweet corn and calabrese, all of which are being grown on contract for canning or quick-freezing.

* An "island" district just north of Great Yarmouth, which is cut off from the rest of East Norfolk by marshes, the rivers Thurne and Bure and the Broads.

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TABLE 2

Principal Vegetables, Bulbs, Greenhouse Crops

	Norfolk	England and Wales
	<i>acres</i>	<i>acres</i>
Brussels sprouts	2,128	48,199
Winter cabbage and savoys	6,027	34,659
Carrots (maincrop)	8,882	29,439
Onions, for harvesting dry	646	4,263
Beans, broad	1,020	7,877
Beans, runner and french	1,156	12,244
Peas for canning and quick-freezing	12,908	48,022
Peas for harvesting dry	8,727	104,932
Asparagus	305	1,404
Celery	1,374	4,588
Bulbs and bulb flowers	799	8,757
Crops under glass	143	4,372
Total vegetables and crops under glass	50,346	466,519

The coarse, sandy loam area of north-west Norfolk and the lighter sandy soils of Breckland further south have, for many years, carried a high proportion of this county's acreage of market vegetables, cabbages, carrots, etc. Another important area of production of a different kind is found in the black peat fens of south-west Norfolk. Nearly all the bulb onions and celery are grown here, together with large acreages of carrots, parsnips, beetroot, etc. Contract crops, as described above, are grown in various parts of the county, with particular concentration around the larger towns where the processing factories are situated.

Asparagus has become another of Norfolk's speciality vegetables. This was pioneered by the late Lord Fisher of Kilverstone near Thetford, who started planting on the wide, single-row American system, in 1933-34. As a light land crop, asparagus has proved highly successful, the selected strains in cultivation locally producing a high proportion of long thick spears.

Except for the contract crops, vegetable growing on the scale described is a highly speculative affair, and were it not for much mechanization and concentration on the cheapest possible methods of cultivation, it would often fail to pay its way. The bulk of the produce goes to London or the nearest Midland markets, and the larger growers frequently use their own transport.

Glasshouse crops

By contrast with the crops previously described, the acreage devoted to glasshouse and flower crops is not large. There are, however, several quite sizeable concentrations of glasshouse holdings in such parishes as Terrington St. Clement, near King's Lynn, and Stalham, Blöfield, Wymondham, Wicklewood, Swardeston and East Dereham, in East Norfolk, and around Norwich itself.

The principal crops are tomatoes, cucumbers and chrysanthemums, with a few specialist growers of other crops including carnations. Pot plants and bedding plants are also grown locally by mass production methods and dispatched to multiple stores all over the country.

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Amongst other interesting crops grown in this county we must not forget lavender, which is cultivated and distilled on a large scale in the extreme north-west of Norfolk and just north of Sandringham. Some 60 acres are given up to this crop which, just before the flowers are harvested in late summer, stand out on the distant hillsides like sheets of blue water.

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The Farm Buildings of Norfolk

R. BEAVAN SAYCE, F.R.I.C.S., Q.A.L.A.S., M.R.A.C.

Agricultural Land Service

The same designs and layouts of farm buildings have served Norfolk for centuries, and it is only since the mechanization of agriculture that modifications have become necessary. Even today, the traditional styles are being blended with, rather than superseded by, the modern additions.

The buildings which serve Norfolk farms today are extremely varied in age and materials. Farming methods are always changing and the buildings have to be changed too. Sometimes they can be adapted to suit new practices, but often they cannot; they fall into decay and have to be replaced by new buildings. The history of farm buildings, not only in Norfolk, but in England, tells the story of farming with some accuracy, for the eras of prosperity and depression are faithfully reflected in the materials used, the layouts adopted and the individual design of the buildings. The effect of changes in land tenure can also be detected.

In this article, however, we are interested in the buildings that exist today and therefore we need go back no further than the evolutionary years of the eighteenth century, which stand but like an Everest among the peaks and valleys of farming vicissitudes. It was this period that saw the development of the farmstead in Norfolk as it stands today, and it was during the 1700s and 1800s that many of the substantial buildings were erected. This was the age of the enlightened landlord—the farming landlord who was a pioneer of agricultural progress and did not hesitate to invest capital in the land. The results of his prudence and foresight have served agriculture ever since.

The development of farm buildings depended on such factors as choice of materials, the inherent fertility of the land, the type of farming and the

introduction of wealth. These factors, more than any others, determined layout and size, and a close study of them will give a true picture of Norfolk farm buildings.

Bricks and tiles

Norfolk is a nearly stoneless county and has never been afforested. When transport was undeveloped, only locally-won materials could be used, and these did not even spread within the confines of the county. However, the very size of Norfolk—it is 80 miles from Great Yarmouth on the east coast to the outskirts of Wisbech in the Fens—gives a range of nine different materials, of which brick, flint, clay lump, carstone, timber and chalk clunch are the most commonly used. Of these, brick is employed more widely because it has always been readily transportable.

Clay bricks were introduced by the Flemish weavers in the fifteenth century. There are still many examples of the old 2×9-inch brick, but in the eighteenth century, bricks were made larger (3 inches thick) because of the imposition of a brick tax. The chief colouring agents are oxide of iron and lime, and the shades vary from a deep red to a pale lemon or white. On the chalk lands the buildings are light in colour; for example, the Holkham Great Barn is of a light grey, and is made from bricks manufactured on the Holkham Estate: bricks and tiles are still being made on this estate. The Norfolk brick is weatherproof and permanent and has given the county its present substantial buildings.

Also of clay origin are pantiles. The Norfolk pantile, which is both concave and convex, was introduced from Holland, and an Act of 1722 fixed the dimensions at $13\frac{1}{2} \times 9\frac{1}{2}$ inches \times $\frac{1}{2}$ inch. Pantiles are bedded on reed and hair mortar, but trouble sometimes arises when the mortar perishes and the pantile shifts. For what it is worth, the story goes in Norfolk that the enterprising gentleman who brought the pattern of the pantile from Holland made an error in his sketch, and this has been carried on! Pantiles are the commonest roofing material in the county, though plain tiles are often seen.

The brick and tile building is, therefore, traditional in Norfolk, and particularly so in the east and central part.

Flint, clay and chalk

Flints, the stone first employed by man, are, of course, the oldest building material in Norfolk. It is used most extensively in south-west Norfolk in the Breckland, but it is also used in north and east Norfolk along the coast. But there is a distinct difference in the appearance of the buildings in these two areas: the flints in south-west Norfolk are large and usually placed with the black inner face of the cut flint on the outer surface of the wall; those in the northern coastal belt are smaller "cobble stones" used whole, with a rounded face to the outside of the wall. Very often many of the flints for farm buildings have come from old churches. A fine example of flint buildings is at Stonehouse Farm, West Harling.

Clay has been used for building in Norfolk for some 300 years, but only in the heavy clay lands of south-east and mid-Norfolk. Clay was spread on the

ground and, after short straw or long grass had been added, trampled by horses. The mixture was formed into blocks $18 \times 9 \times 6$ inches, and laid in clay mortar on a brick or flint plinth. The walls thus built were finished with a clay slurry, topped with tar, sanded and colour-washed, and so made waterproof. Nowadays, walls are merely tarred, giving a very sombre appearance; defects are remedied by cement rendering, but unless this is done properly it can be bad practice because the cement, being stronger than the clay, tends to fall away.

Thatch is the commonest roofing material for clay lump buildings, because straw is plentiful on the heavy grain-growing lands and quantities of reed are available on the marshes. But thatching is very expensive now.

Although Norfolk is almost without stone, a soft, coarse-grained ferruginous sandstone—carstone—is mined at Snettisham, near Hunstanton, and makes good building material. Its colour varies, but is usually blue-grey to red. It is used like ordinary building stone as ashlar work, squared rubble built to courses, or random rubble. There are some modern houses built of it on the Sandringham Estate.

As there were no large forests in Norfolk, stud and boarding are not found as frequently as in Essex, Kent, Sussex and Hertfordshire, but have been used in south-east and east Norfolk. The construction is generally a dwarf wall of brick or flint with vertical posts tenoned on to an oak sill, and the upper ends into a horizontal headpiece. These form the studs for weather or feather-edged boarding, which is then tarred or creosoted. This method of construction is common for barns and granaries.

Through central Norfolk the subsoil is chalk, and where the chalk is particularly hard it is quarried for building purposes. Walls are built of large pieces, roughly dressed and set, often with flints, in a lime mortar. Many examples can be seen when travelling to Norwich from Thetford. Often the farm buildings were built of chalk clunch obtained from old ruined priories and abbeys, which became the village quarries!

These, then, are the main materials; there are others, and a mention might be made of wattle and daub which occurs occasionally, and which is probably the oldest building method still existing.

Inherent fertility and land tenure

The number of farmsteads per parish and their layout, depends mainly on the fertility of the land. Excluding the fens, the more fertile parts of the county lie to the east, with a belt through mid-Norfolk. In the south-east there is heavy land over clay; to the north, lies the Holt-Cromer ridge of poor, gravelly soil; the north-west, an area of lighter land over chalk, is grain-producing today, but was formerly a sheep district; and in the south-west is the Breckland. Finally, there are the Fens, which are highly fertile, intensively cultivated, and utterly dependent on efficient drainage. In the north-west the farms are large in area with the farmsteads widely scattered, but built to serve big acreages, and to handle heavy crops of grain and fattening bullocks. As one moves towards the south-east, the farmsteads become more frequent but more compact in layout, to handle smaller acreages. This frequency and size of farmsteads is also linked to land tenure and the introduction of outside capital.

Historical layout

Since the eighteenth century, Norfolk has been predominantly arable, the grain harvest being the mainstay of farming enterprise and the barn the hub of activity. The corn was carted in harvest wagons to the barn, which was long and high, with double doors in the centre of the two side walls. The unthreshed corn was stored at both ends of the barn, and the centre became the threshing floor. Flailing and sieving on this floor with the doors open, caused the chaff to blow out on one side. By building the yards on one side of the barn, the chaff and straw went straight into the yards to be made into muck. "The barns of Norfolk are among the biggest in the country, 24×18 feet being considered a good-sized threshing floor."* The barn at Waxham, built about 1170, is 160×30 feet, and is probably the longest in the county. A height of over 15 feet to the eaves is very common.

The large barn thus protected the yards from the north. Even though unused for many years, these yards still cover the biggest area of Norfolk farmsteads. They are semi-covered, open to the south, but with good protection against the cold north-east winds. From root sheds at convenient corners, chopped swedes and turnips were fed in hanging wooden mangers, with hayracks above. These methods are still in use today. In many cases elaborate drainage systems were installed, and, but for neglect, would still be functioning well.

The core of Norfolk buildings then is U-shaped, facing south. From this core other arms extended, making an E-pattern to provide stables and horse yards, bullock-fattening boxes, granaries, chaff-houses, and loose boxes. Stables were large, the horse being the motive power for working the big arable acreages. Carts were often housed under the granary in open sheds supported by oak posts.

This layout, evolved over a hundred years ago, is to be seen in all but the most modern of Norfolk buildings. In addition, the larger farms often have "off buildings" for bullock fattening.

Conversion of traditional buildings

Scientific development, the changes in markets brought about by easier transport, and times of depression in this century have resulted in buildings being adapted or neglected. Mechanization of harvesting and threshing has left the barn as a general storage place. The old bullock boxes and stables have been converted to cowsheds, or piggeries. The bullock yards housed the dairy herd and followers. Unfortunately, the old buildings were not suitable for the new machines, which, perforce, had to go unprotected. But the old cartsheds could house tractors, and often the barn became the workshop. Around the buildings, now put to fresh uses, are the modern additions—an implement shed, piggeries and a Dutch barn, and, to meet the stricter conditions for milk production, a new cowshed or parlour.

Can these traditional buildings be successfully adapted and their life further extended? For dairying, the yard-and-parlour system can use the old bullock yards, though the circulation of cows often presents difficulties.

* M. E. SEEDHOM. *The Evolution of the English Farm*. London, Allen and Unwin.

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Within the last few years, the most striking conversion has been the installation of grain-drying and storage equipment in the barns. The wide doors give easy access for tipping-trailers and lorries, and the height allows for the maximum use of space by square grain bins.

Another modern conversion has been the adaptation of the old bullock boxes and the yards for pigs. But conversion for livestock is not easy because of the greater attention now paid to internal climatic conditions. It has not been possible to use the old cartsheds and stables for tractors and implements; new buildings have to be provided for this equipment.

New buildings

The twentieth century might be called the steel and concrete age of British farming. The use of steel began to increase in Victorian days and the pseudo-artistic whirligigs have been superseded gradually by the clean utilitarian lines of today. So side by side with the brick, clay lump, chalk or flints are the steel and concrete implement sheds, tractor sheds and workshops, cow-houses and dairies, grain stores and even pig- and poultry-houses. The layout has followed the traditional pattern, with the grain store and food preparation buildings still forming the hub, though in pre-war days one large farming company of Dutch origin erected very large all-in-one buildings on each of its farms.

New types of specialist building such as piggeries, poultry-houses, potato storage buildings and horticultural buildings are appearing. But here the story merges into a common stream covering all England; these developments are not peculiar to Norfolk.

Separate mention must be made of the Fens, whose cultivation is relatively new. The capital invested in the Fens has nearly all been spent on drainage, no local building materials are available, and building costs are high on the peat soils. These are the reasons why farm buildings in the Fens are few, often temporary, and frequently of corrugated iron. The Fenman can cope with his staple crops of wheat, sugar beet and potatoes without buildings, and is acclimatized to the harsh weather! No wonder he is called a Fen "Tiger"!

The Norfolk farm buildings have served the farmer for over a hundred years. Will they continue to do so? It seems doubtful. The present search for an increase in power, for the reduction of man-hours per acre or per yield of crop inevitably points to a new concept of farm building design. The bold plan of grants for fixed equipment may see an upsurge of farm building construction. But unless the buildings of the eighteenth-century "agricultural revolution" are bulldozed down to form rubble for the new buildings, they are likely to stand as mute witnesses to the quite exceptional foresight of our ancestors.

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Terrington St. Clement

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Director

COMPARED with some of the other farms in the Ministry's chain of Experimental Stations, Terrington is small—only 205 acres. But in conjunction with its sister farm at Kirton, it is concerned with an extensive range of high-value cash crops grown on the productive silt soils around the Wash, from King's Lynn in Norfolk to Boston in Lincolnshire. The total area of these soils is relatively small, but their agricultural importance is unquestioned. The Kirton farm, which will be more fully described in a later article in this series, grows many of the vegetable crops common to the area, and specializes in brassicas, although a big proportion of the experimental programme is devoted to bulb production, an important and expanding industry in the locality.

The soil at Terrington consists of a sea deposit of alluvium, containing a very high proportion of fine sand, silt and clay; there is a marked absence of stones and other coarser soil fractions. It is difficult land to work in wet conditions, but produces an ideal medium for growing crops if allowed to weather in a rough state during the winter. Tile drainage is necessary in most fields.

The Ministry bought the farm in 1947. Part of it had been used previously by the Norfolk County Council as an experimental farm; the remainder had been privately owned for some time, although it had originally consisted of three separate smallholdings, each with its own set of farm buildings. The unit, as taken over by the Ministry, therefore consisted of four holdings, each with its own buildings, but forming one compact block. The present administrative centre is in the buildings previously used by the Norfolk County Council, and the other buildings have been developed as out-centres for the housing of cattle and pigs. Besides the normal farm buildings, glass-houses covering half an acre were taken over and have been maintained as a separate experimental unit, mainly for tomatoes and chrysanthemums.

The farming

The farm is nearly all arable. As far as possible, only crops of direct cash value are grown. A few fattening cattle are usually kept, but only as specialized units or converters of by-products; a fairly large pig herd is maintained as a separate unit with its own labour force, to provide farmyard manure for the extensive range of root and horticultural crops.

On both the medium silt and heavy silt soils, five-course rotations are practised, each based on maincrop potatoes, and from these comes the chief income of the farm. Cereals and peas are also included. Sugar beet is grown

only on the lighter soil and is replaced in the heavy-land rotation by beans or a "seed" crop. The two rotations are:

Medium silt—Potatoes, wheat, sugar beet, barley or oats, peas.

Heavy silt—Potatoes, seed or wheat, wheat or beans, barley, peas.

It is obviously essential to keep the farm free from Potato Root Eelworm, and for this reason alone the rotation is wide, potatoes occurring only once in five years.

The area under grass is strictly limited, being confined to small paddocks at each set of farm buildings. Until five years ago all these paddocks were permanent pasture, but they are now being ploughed in turn and, after a short arable rotation, are seeded back to temporary leys for the use of the pig breeding stock. We find it desirable to rest the heavier fields occasionally for a year, and this can be done without upsetting the rotation by substituting a one-year clover ley for peas at the end of the heavy-land rotation.

The labour force is kept to a minimum commensurate with the demands of the commercial and experimental programmes. Each of the specialist units has its own labour force, but both may be drawn on to help with general farm work during peak periods such as the cereal and root harvests. No casual labour is employed, and the cropping is so arranged that there is useful work for the full staff throughout the year. The tomato crop makes a peak labour demand during June and July, but as other farm work is slack then, most of the picking can be completed before the cereal harvest begins. In the past, the half-acre of glass has been devoted entirely to tomatoes, but chrysanthemums have been introduced recently both as an additional cash crop and to employ the staff more fully during the period immediately before Christmas.

The pig unit

The pig unit is the principal livestock enterprise and produces most of the farmyard manure required for the potato crop. It was started five years ago with five or six sows, and has been developed to fit into the new farming system. The breeding policy is to maintain a herd of thirty to thirty-five sows, farrowing twice a year, with all the offspring being fattened on the farm. The breeding herd is on free range, and sows are penned only for a period of eight to twelve weeks at farrowing. To meet the needs of the experimental programme, two pedigree herds are maintained—Large White and Essex—and a proportion of first-cross breeding gilts are also kept for the commercial unit. The detailed recording system, which has been in operation since the herds were founded, has helped in building up the bacon strains of both breeds, and has also revealed the losses that can occur from virus pneumonia. Steps are being taken to free the herd from this disease, while still maintaining the strains developed over the last five years; the system adopted entails strict isolation from farrowing onwards, and the slaughter test when the pigs reach pork or bacon weight. Only gilts from clean litters are kept for future breeding stock, and these are maintained in a separate herd away from the main unit until all infected stock have been cleared. The risk of serving clear gilts with contaminated or untested boars has been overcome by the use of home-bred healthy boars, and by artificial insemination, which

will also be used to bring fresh blood into the herd as required, once the unit is completely free of the disease.

The feeding policy is flexible to allow for the maximum use of home-grown grain and by-products of the arable crops. The breeding stock, running at grass, are fed only a limited quantity of concentrates, but they also receive chat potatoes, fodder beet and other roughage as they become available. Only immediately before and during the suckling period do the sows receive a liberal all-meal diet sufficient for maintenance and full production for the litters. The fattening pigs are on a controlled diet throughout their lives, although the level of feeding during the early stages is normally sufficient to be considered as *ad lib.* feeding. The quantities of meal used are determined on a weight basis, and the maximum allowed is 5½ lb per day, which is reached by the time the pigs are about 150 lb live weight. During the winter and spring periods large quantities of cooked chat potatoes are fed, replacing the meal at the rate of 4 lb of potatoes per lb of meal, up to a maximum of 12 lb of potatoes per day.

Livestock experiments

Experimental work on livestock is confined to the pig unit, and all available facilities are devoted to breeding experiments. An extensive trial on "cross-bred vigour" has recently been completed and the full results will be published soon. The Essex and Large White breeds were used, as being representative of widely differing types of animals, and both the pure breeds and the reciprocal crosses were included. A further trial extending this work is due to start in the near future; breeding from first-cross gilts will then be added, so that an accurate estimate can be obtained of the value of "cross-bred vigour" both in the breeding stock and in the cross-bred animal for bacon production. Work has also started recently to determine the effect of early weaning on the length of life of the sow. This is a long-term project from which information will slowly accumulate as the number of animals under test increases.

Crop experiments

Nearly every arable field on the farm is given over each year to some form of experimental work, and generally there are from 1,200 to 1,600 plots, most of which are concerned with fully replicated experiments. The programme includes both long-term trials of national importance and short-term problems of national and local importance. In the long-term category the straw disposal experiment will probably be of great interest ultimately, but although the trial has already completed one six-year rotation, differences in treatment effects are only slowly becoming apparent. A second long-term trial—the depth of ploughing experiment—has also completed one five-course rotation; so far the results from six- and fifteen-inch ploughing have been surprisingly close, even for root crops such as potatoes. It will, however, be interesting to observe any differences that may occur in future rotations, bearing in mind the fact that the field has been deep-ploughed nearly every year up to the beginning of the trial.

In the short-term programme, emphasis is placed on the potato and pea crops, since these are of special interest in the area. Terrington is regarded as one of the main potato testing stations, and problems of manuring, cultivation and disease control are constantly under review. In addition to this field work, an extensive experimental programme has recently been started to determine the best conditions for the storage and handling of seed potatoes. An entirely new type of seed store has been built to give greater control of the environment than can be obtained in the normal glasshouse type of chitting store. Careful observation of sprout development in the store is being followed by full-scale yield trials in the field so that initial growth can be related to final yield. Both early and maincrop varieties are under investigation, and the work may prove to be of particular interest to growers for the very early market.

Terrington is also a main sub-centre for the potato variety trials organized by the National Institute of Agricultural Botany, and many varieties are grown. These cover new and as yet unnamed stocks, as well as established varieties, and those already on the Recommended List. In 1957, forty-seven recognized varieties are in trial or under observation, while a further nineteen are being grown-on to test yield and disease resistance prior to their possible use as breeding material for new disease-resistant varieties. Not only will the yield and field character of each be noted, but many will be subjected to cooking tests before a final assessment is made.

The farm also carries a full range of N.I.A.B. cereal and pulse trials, for the Institute has no other sub-centre on the silt soils. All new varieties, whether of wheat, barley or oats, are now grown at three levels of nitrogenous manuring to give a more accurate estimate of their yield and standing capacity. Besides those under full-scale trial, newer varieties are also under preliminary observation before their possible inclusion in full-scale trials later on. There are also other trials on both cereals and peas, dealing with such factors as seed rates, times of sowing, disease control and nitrogenous top dressings, all of which require investigation on this type of soil.

Horticultural experiments

As already mentioned, the farm, like others in the district, has a small but not insignificant horticultural unit, and trials on problems of local importance are undertaken whenever possible. Most of the trials deal with the tomato crop, and range from an examination of new varieties to cultural practices, such as density of plant populations and methods of manuring. All the trials are fully replicated, and have given valuable information concerning the suitability of many of the new "first crosses" for local conditions.

Work has recently been started on strawberries, which are important locally. A variety trial including ten varieties has been started, and it is hoped to follow this in the near future by trials dealing with manuring and cultivation problems.

The Norfolk Agricultural Station

F. RAYNS, C.B.E., M.A.

Director

For nearly fifty years the Norfolk Agricultural Station, at Sprowston, has been one of the most important links between the research worker and the farmer.

THE pages of our agricultural history are filled with references to outstanding Norfolk landowners, farmers and agricultural workers, and their contribution to British farming is adequately recorded, but much that followed received less recognition. For example, between 1885 and 1907, the members of the Norfolk Chamber of Agriculture experimented diligently on farms in Norfolk, drawing liberally on the scientific advice of the great personalities of the day at Rothamsted, Woburn and Cambridge. From this very useful work grew the idea of establishing the Norfolk Agricultural Station, and in 1908 a circular was sent round the county asking for £1,000 to set up an experimental farm and suggesting, "The farm should be a demonstration farm rather than an experimental farm. It should put to the test of actual farming practice the latest discoveries of the experimental Stations and give farmers the chance of seeing them carried out on a commercial scale." The money was soon subscribed and now, almost fifty years later, these objectives continue to be fulfilled by the Station, which tries to farm well and demonstrate good practice.

In spite of the original concepts, the Station at Sprowston has become an experimental farm, for it was difficult to see how to test the latest discoveries without doing some experimental work. Thus development has been towards investigation rather than demonstration, incursions into what might be regarded as the legitimate field of research being avoided—although the distinction between experiment and research is difficult, perhaps impossible, to define.

At Sprowston, problems which can be investigated in the field rather than the laboratory are regarded as appropriate in the programme, and although the Station has a small laboratory for sugar beet and vining pea analyses, laboratory work and problems requiring laboratory techniques are of minor importance.

The Station is a private enterprise, controlled by an Executive Committee and financed through a Membership Scheme and by grants from the Crop Variety Testing Scheme and the Sugar Beet Research and Education Fund. Apart from these grants, which are spent entirely on testing varieties of cereals and root crops and investigations on the cultivation of sugar beet respectively, and the assistance of three technical officers seconded by the Ministry of Agriculture, Fisheries and Food, no outside help or finance is available. The Station sinks or swims according to its farming success; its capital in 1908 was just over £1,000, and by 1956 it had increased to £46,125. So if the financial results of the farming are the sort of test the originators of the Station had in mind, their aspirations have been fulfilled.

The farming system

The Station owns 319 acres of its farms and hires a further 114 acres; of the total 433 acres, 405 are arable and 28 grass. The grass consists of 20 acres of temporary pasture, and 8 acres of parkland unsuitable for arable cultivation. The soil is a light to medium loam overlying brickearth level, 20 feet above the sea and naturally well drained. Its uniformity offers plenty of scope for suitable sites for experimental work, and although the soil sometimes suffers from drought, in most years the average rainfall of 25 inches is sufficient to offset the free-draining tendencies.

The arable land is worked in five blocks, each consisting of about 80 acres. This facilitates the practical working of the land, but it has proved a little awkward for demonstrating to farmers, who naturally begin to tire when confronted with field after field of the same crop.

The aim of the rotation is to produce good, disease-free crops (some trouble from soil-borne cereal diseases has been experienced), maintain the livestock entirely on the by-products of crops sold for cash and produce a cash income of at least £50 per acre from crops. This requires careful integration of crops and stock; the basis of the cropping is a five-course rotation in which the old Norfolk four-course rotation of wheat, roots, barley, one-year ley for hay, is extended by introducing a second crop of malting barley, replacing the traditional mangolds and swedes by sugar beet and potatoes, and about half the hay by vining peas. Vining peas are also used to break the succession of two cereals where Eyespot is likely to be troublesome. Thus every crop is a cash crop, including the small acreage of hay, from the aftermath of which clover seed is taken.

Beef production

The livestock policy is one of beef from calthood to sale fat at about twenty-months old, at roughly 9½ cwt live weight. Friesian and Angus-Friesian cross calves are bought from a friendly neighbour and pail-fed on milk substitutes from 3 to 6 days old, and no fresh milk is given after the colostrum on the parent farm.

These cattle are important to the farming system, which depends largely on farmyard manure to maintain the condition of the land. After feeding bought concentrates in the early rearing stages, calves go out to grass in May after the first winter, come into the yards in October and usually finish to catch the better prices of April and May. Two winters of indoor feeding and only one on grass may sound a costly way of producing beef, but the chief expense, feeding, is partly offset by eliminating from the rotation the labour-absorbing and cash-freezing root crops like mangolds, swedes and kale. Beet tops, chat potatoes, beet pulp, and pea haulm silage (after the New Year) and no concentrates except tail barley, and wheat and oats, reduces the cost of food appreciably: all is home-grown, except a small quantity of high protein food occasionally required to keep the animals going.

Labour costs have also been reduced by modernizing the cattle yards for easier feeding, straw and muck handling. Two men now handle 140 head of stock; muck-carting is completely mechanized and, as far as possible, so is the cultivation of cereals, potatoes, vining peas and beet.

THE NORFOLK AGRICULTURAL STATION

Such an intensive system, with no grass in the rotation, calls for considerable expenditure on fertilizers although all the straw is made into muck. Each field is in fact fertilized annually, and the total fertilizer bill for the year amounts to between £8 and £9 per acre.

Livestock experimentation is confined to work with beef cattle. At present the Station is co-operating with the Agricultural Research Council in comparing the suitability for beef of the male progeny of selected Friesian bulls, standing at the local A.I. Centre. Last winter, twenty yearling cattle were implanted with stilboestrol and their performance and carcass conformation compared with those of a corresponding group of animals. Full results are not yet available, but the records from monthly weighings appeared to confirm the improved liveweight gain which other workers have demonstrated.

Variety testing: soil fertility

The Station was one of the first regional sub-centres of the National Institute of Agricultural Botany, and variety trials with all the principal arable crops grown in East Anglia have been a feature of the farming for many years, and are a major source of interest to the farmers who visit the Station during the summer. Since 1955, the Station has co-operated with the Plant Breeding Institute at Cambridge in testing, at Sprowston, breeders' materials of wheat, barley and oat selections. By obtaining information about disease resistance, lodging and other field characters under different conditions from those found at the parent trial ground at Cambridge, a more rapid assessment of the value, or otherwise, of a particular selection can be made.

The maintenance of fertility under intensive arable production, and on the free-working loams of East Anglia, is critical for the whole farming system. Immediately before the last war, when yard fattening was unprofitable and machinery for handling muck had not yet been developed, there was much interest in the direct return of straw to the land and its effects on soil fertility, compared with the benefit from the same straw trodden into dung. Experience at Sprowston is that ploughing in straw increases yields to some extent when the general level of fertilizer is low. The quantities of fertilizer used for all crops, particularly cereals, are much higher today than they were when the experiments on straw disposal began some twenty-five years ago. So the main aim of the work is to determine the value of organic materials such as muck or straw when crops also receive generous dressings of chemical fertilizer. The results so far show that, for potatoes and sugar beet, muck benefits yield even when supplemented with ample chemical fertilizer.

Sugar beet

From the earliest days of sugar beet growing in this country, the Station has been concerned with husbandry investigations on this crop. In the beginning, the main emphasis was on correct manuring for the crop, and such problems of cultivation as how best to ensure the most satisfactory plant population, and how the time of sowing and harvesting influences the yield and quality of the roots. Since the war, however, the work has been concentrated increasingly on the question of saving labour at the peak spring period when the beet are thinned.

THE NORFOLK AGRICULTURAL STATION

The use of rubbed and graded seed has eased the work of thinning, because fewer excess seedlings are produced. Experiments are still in progress at Sprowston to determine the properties of different grades of treated seed and how far they can be relied on to produce a high proportion of single seedlings without failure of germinative power. Further savings in singling time are dependent on more regular distribution of seeds in the row. By using improved drills which deliver seeds one at a time and at regular intervals, the quantity of seed can be reduced, and the resultant seedling stands are thinner and easier to single; but the success of this practice depends on seedbed conditions and the skill of the cultivator. For example, at Sprowston in 1956, good results were obtained from seedings of only 2 lb per acre, but this year, in less favourable tilth conditions, the same seed rate has not produced enough plants to ensure maximum yield.

Economizing in thinning labour by the use of down-the-row thinners has also been investigated at the Station and, as with the other aids to singling, the effects of the treatments have been measured by timing hoe-men on the plots as well as by braird studies. At Sprowston, the use of a down-the-row thinner has enabled a saving of about 20 per cent in the hoe-men's time (taking no account of the second hoeing) without any appreciable reduction in plant population or yield. Work in progress on controlling the weeds in sugar beet seedbeds by chemical means is also encouraging and helping towards the ideal of a weed-free, accurately spaced, single-standing braird of root crops. It is believed that the above principles can be applied to all root crops and save appreciable costs in singling labour.

Potatoes, peas and cereals

During the war, the cultivation of potatoes, formerly confined to specialized areas of fertile soils, became more widespread, and successful crops were grown in many areas which had hitherto been considered quite unsuitable. On the Sprowston farm, potatoes now occupy an important place, and satisfactory crops of King Edwards can be grown, provided they are generously manured and careful attention paid to cultivation. Fertilizer trials have indicated the approximate levels of manuring for the best yields. Present experimental work is directed at testing the value of chitted seed (an artificially-lighted chitting-house having been installed for the commercial acreage) and the effectiveness of spraying in controlling the spread of virus in the ware crop. The latter is a large-scale investigation carried out in co-operation with Rothamsted and has considerable interest for growers in the Eastern Counties, because if the breakdown of stocks could be effectively halted, greater use could be made of once-grown seed.

Vining peas have become very important in those areas of the Eastern Counties near the quick-freeze or canning factories. Although a good deal is known about the cultivation and field behaviour of threshed peas, it is felt that because of the great importance of quality in peas harvested green, and the need to grow special varieties, it cannot be assumed that the effects of fertilizer and other cultural factors are the same for vining as for threshed peas. For this reason, work on the crop has been started at Sprowston. This year the effect of fertilizer placement on yield and quality is being studied and a comparison made between peas grown on 7-inch and 14-inch rows; the

reaction of the crop to various herbicide sprays will also receive attention.

Wheat and malting barley are, of course, crops of major importance on an East Anglian arable farm. Work with these cereals has concerned many aspects of their cultivation, especially the response from nitrogen that can be expected where new and improved varieties are used, and how the profitable use of fertilizer is related to variety or affected by husbandry factors such as time of sowing, seed rate, row width and time of application of the fertilizer. At Sprowston, the nitrogen use can be almost doubled on good standing varieties of all cereals, compared with those cultivated only ten to fifteen years ago.

Farm results

The gross output of the farms was £61 per acre, including grass, in 1956 and £67 per acre in 1955; the net output for the same years was £52 and £58 respectively. Comparable figures for the year ended April 1957 are not yet available, but the output will probably be higher because yields of potatoes were much better. Yields per acre for the 1956 crops averaged: wheat 18 sacks (40½ cwt), barley 15 sacks (30 cwt), potatoes (King Edward) 10 ton ware, sugar beet 15½ ton washed beet, and vining peas 21 cwt.

Sandringham

J. D. FOSTER, B.SC., F.L.A.S., A.A.I.

Agricultural Land Service

The Royal Estate at Sandringham covers nearly 20,000 acres, and in all its enterprises furnishes a splendid example of what good landownership connotes.

GOOD estate management is not a matter of professional efficiency backed by a good bank account. Fundamentally, an owner must be interested in his land, to provide ideas and directions as well as cash, to criticize as well as encourage and generally to stamp on his estate the imprint of his personality.

It might be thought that on a Royal estate the personal touch of the owner would be absent. The Queen is kept busy with affairs of state, both at home and abroad, yet at Sandringham the visitor is immediately impressed by the manifest love and attention devoted to the estate by successive Royal owners and their families. Queen Alexandra died at Sandringham, so did the Duke of Clarence, King George V and King George VI. Five of Queen Mary's children were born at York Cottage in the grounds of Sandringham Park.

The Sandringham Estate was purchased from Lady Harriette Spencer Cowper, a niece by marriage of Lord Palmerston, in 1861 out of the funds of the Duchy of Cornwall. The Prince of Wales, for whom it was acquired, had three main interests. They were international politics, shooting, and racing. At Sandringham he was able to entertain lavishly and to satisfy these

interests. The original estate was only of about 3,000 acres, but the sporting was enlarged by hiring extra shooting on neighbouring estates. A good deal of planting-up of woodland was carried out, but in this department game preservation was probably the first consideration.

King George V was specially interested in Sandringham. He shared his father's love of racing and was interested in the farming. His enthusiasm for shooting was boundless and his exceptional skill as a shot was universally recognized. During his reign he increased the size of the estate to about 15,000 acres and concentrated on the stud of shire horses with which he won many prizes. He also started the now famous herd of Red Polls and developed the flock of Southdown sheep.

During all this time of development the estate had been acquiring character and tradition. By the end of King George V's reign, it was a fine sporting estate with much valuable pedigree stock, a large number of estate cottages (some of them model cottages for their day) and other estate buildings to be maintained. In 1936, it was an estate typical of the best of the nineteenth century, but needing a reorganization in its management to bring it into line with twentieth-century economics.

Development of the home farm

It is a curious coincidence that just as King George V grew to love the Sandringham Estate when he was Duke of York so did King George VI. Like his father, he was a first-rate shot and a very keen all-round sportsman. There is no doubt that Sandringham appealed to him primarily as a sporting estate. He was, however, also extremely interested in the farming side and he saw the need to run the estate on business lines. He, it was, who increased the size of the estate to its present acreage of just under 20,000 acres and the area farmed in hand to 2,300 acres. It is an axiom in land agency circles today that an estate needs a healthy and profitable home farm, but the fact was hardly appreciated twenty years ago, and in so doing George VI showed exceptional foresight. The racehorses were moved to Hampton Court, the stud of shire horses was given up and the pedigree Southdowns, though some were kept until the war, were completely replaced after the war by a commercial flock of cross-breds. He kept a herd of Jerseys and developed further the Red Polls with which he had many successes in the show-ring.

At the outbreak of war, the King quickly gave instructions that the last ounce of food must be wrung out of the Sandringham farms. Much of the thousand acres of silt land at Wolferton was permanent pasture. This was all broken up to realize its maximum potential as arable and leys. Proper draining and the laying of concrete roads proved a very sound investment. The park, which had only provided grazing for a herd of deer, was ploughed and even some of the lawns were planted with potatoes.

The great estate management achievement during this reign was the modernization of the properties on the estate. Except for a few isolated cottages, the provision of electricity to the whole estate was completed in 1948. Since the war, with co-operation from local authorities, piped water has been supplied to all properties. This modernization was no small effort for an estate with some five hundred cottage properties scattered amongst a

number of very rural villages. The King turned his old home, York Cottage, into an estate office and five flats. He scrapped the old electricity plant and put in the mains.

If the history of any estate is studied it is usually possible to discover a period of renaissance. Sandringham, bought for King Edward VII, enjoyed by King George V, undoubtedly saw its renaissance when King George VI was "Squire of Sandringham".

But this period of improvement on the estate has gathered further impetus since our Queen came to the throne. Both she and the Duke of Edinburgh are keenly interested in all that goes on. Every month a report on the estate is sent to them wherever they may be. The farming, forestry, weather and game are not the only points covered in this report—all the significant happenings during the month are included. The social events are not omitted. Not a death nor a marriage amongst tenants, pensioners and employees occurs without the Queen knowing of it. Almost daily, when she is in residence, the Queen rides on the estate and she is often accompanied by the Royal children on their ponies.

The Red Poll herd has been expanded. The Jersey herd has been exchanged with the Beef Shorthorn herd which was first established at Windsor by the Prince Consort. In addition to the Shorthorn herd, Galloways are crossed with a Beef Shorthorn bull and again with an Angus bull. This beef herd is kept on the Wolferton farm. The Red Polls and the sheep are kept at Sandringham. The sheep are Scotch Half-breds bought in the North of Scotland. They are crossed with a Suffolk ram and then crossed again with a Hampshire.

The scientific approach

Perhaps the biggest trend in the past few years has been a scientific approach to new farming and farm buildings techniques, and a new plan for afforestation. The bacon pig enterprise has been developed in the buildings of Flitcham Hall farm. The old stables and boxes have been converted for fattening- and farrowing-pens and the latest ideas on insulation incorporated in the design; materials used include concrete made with lightweight expanded clay aggregate, sawdust cement blocks and compressed strawboard. Here the Large Whites, properly housed, are fed mainly on home-grown foods.

Appleton Farm is the main centre for the Red Poll herd. The old yards have been gutted and in their place a modern fully-covered yard has been built; it is 143 x 94 feet, with a portal-framed roof, and houses a hundred cows. It is a business-like building without frills and designed to save labour. Feeding passages allow a tractor and trailer to drive right through, and mechanical mucking-out is made simple. An excellent milking-parlour has been conveniently sited by adapting one of the old buildings. Sixty-five cows are milked in the six standings by two men in about two hours. Adaptations have also provided calving boxes and calf housing.

Another new venture is the fruit farming. Black currants are now being grown, and 56 acres of apples will soon be in full bearing. To cope with this crop, a new gas store has been erected. The shell of the building, which is of pre-stressed concrete, roofed with asbestos sheet, has been walled in by

estate labour, using concrete blocks made on the estate as a wet weather job. Again the signs are of a forward-looking scientific enterprise carried through with sound business-like economy.

Present developments are the provision of more roads and better drainage on the Wolferton silt land, and this, no doubt, will be followed by further enclosures of saltings. This land will become almost as good as the best silts on the other side of the Wash in the Holland division of Lincolnshire.

Another small but significant pointer to the enterprise on this estate is the recent mechanization of the garden cultivations and the growing of mushrooms as a profitable sideline.

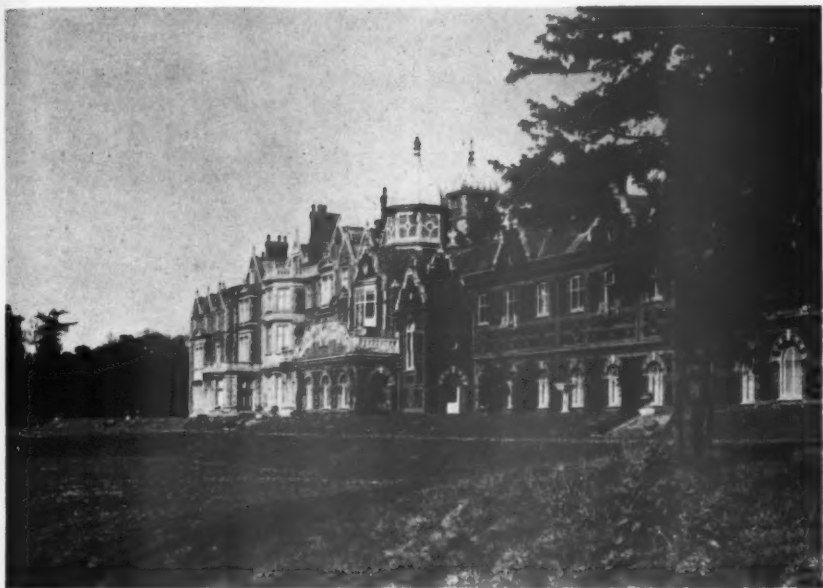
Heath and woodland

And now a word about forestry, which is important not only for silvicultural reasons but for sporting and amenity reasons too. There are about 4,500 acres of heath and woodland on the estate. Much of the heath surrounding the park is covered with heather or rhododendrons. Thousands of holiday-makers come to enjoy the scenery. The children play and the older ones prepare the picnic with just that little extra pleasure from knowing that they are there by favour of their Sovereign. It is traditional that estate staff should treat these visitors with the greatest courtesy; any forestry planning must take fully into account the need to leave plenty of space for these "guests" of the Queen.

The risk of fire which such hospitality inevitably incurs must be a special anxiety for the estate staff. The estate has had its own fire service for many years. During the war it was incorporated into the National Fire Service, and still serves not only the estate but the whole district.

The woods proper cover some 1,500 acres, of which 550 acres are preponderantly coniferous high forest and 570 acres broad-leaved high forest; the remainder is felled woodland. About 500 acres of the woodland are not fully productive and much of the whole is mature or over-mature. In the past, the woods have been managed with more emphasis on sporting and amenity than on forestry proper, but there is still much fine timber. There is little doubt that the whole can be made most productive without sacrificing sporting and amenity. With this purpose in view, a Working Plan has been produced in consultation with Mr. Backhouse, the Conservator of the Forestry Commission in East Anglia. The plan also covers an area of heathland which it was decided to afforest and the total area involved is now some 2,000 acres. The objects of management are to make the woods fully productive so that they are at least self-supporting financially, to conserve amenity, and to produce as high a volume of fine quality timber as is consistent with the foregoing.

All work on the woods is being financed from them, and this naturally has exerted considerable effect on the work envisaged. Briefly, the plan covers the planting or replanting of 1,000 acres within a set period, and by the end of the current season, some 300 acres of this will have been achieved. During this same period, some 400 acres of existing woods, almost all thinly-stocked areas and certainly all over-mature, will have been clear felled. Attention to the large area of young plantations is being given priority and arrears of thinning—by no means serious—will be wiped out early in the plan period.



Sandringham House.

Photo: L. E. Collinson



Mechanical trencher and tile-layer at work on Wolferton Marshes.

Photo: J. D. Foster

SANDRINGHAM



The Queen's horse, Aureole, which was placed second in the Derby in Coronation Year.



Photos: L. E. Collinson

Red Polls on Appleton Farm.

SANDRINGHAM



Photo: J. D. Foster

A corner of the estate yard.



Photo: L. E. Collinson

The wood-working shop.

Grant of Arms to the Country Landowners' Association dated March 20, 1957



Extract . . . assign the Arms following for The Country Landowners' Association that is to say Vert a Chevrene between in chief two Garbs and in base a Portcullis Or over all a Chain in orle Gold And for the Crest On a Wreath of the Colours On a Mount Vert in front of an Oak tree Fructed a pile of four Faggots all proper as the same are in the margin hereof more plainly depicted And by the Authority aforesaid I the said Garter do by these Presents further grant and assign the Supporters following for The Country Landowners' Association that is to say On the dexter side a Lion supporting a Staff Or and on the sinister side a Dragon Gules holding a Spade Gold . . .

Description and Explanation

BLAZON

Arms: Vert a chevron between in chief two garbs and in base a portcullis a linked chain in orle all Or.

Crest: On a wreath of the colours Or and Vert on a mount Vert in front of an oak tree fructed a pile of faggots all proper.

Supporters: On the dexter side a lion supporting a staff Or on the sinister side a dragon gules supporting a spade Or.

MEANING

The Arms

The *shield* is green (Vert) representing the pastures of England and Wales.

The *chevron* is symbolic of a rafter representing fixed equipment.

The *garbs* are sheaves of wheat.

The *portcullis* symbolizes the fact that the Englishman's home is his castle.

The *linked chain* symbolizes strength through co-operation.

The heraldic term *in orle* means in a circle round the shield.

The Crest

The wreath is divided into the two colours of the shield; i.e., green and gold. These are the livery colours (if ever used).

The oak tree represents forestry. The pile of faggots symbolizes strength from individuals being bound together.

The heraldic term *proper* means in its own individual natural colour.

Supporters

The lion and staff represents the landlords.

The Welsh dragon and spade represents the owner-occupier.

MOTTO: *Terrae Servimus*, We serve the land.



First President of the C.L.A.
Rt. Hon. Walter H. Long, M.P.
1907-17



Present President
The Earl of Bradford, T.D., D.L.
appointed October 1955

Photo: *Sport and General*

By Marsh and Fen



Salthouse Marshes.



Marshland fen.

Photos: Hallam Ashley

By Yard and Range

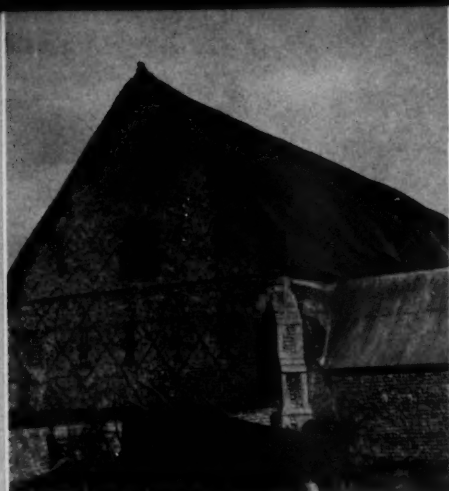


Norfolk men still like to see a well-finished bullock.



Ducklings on a Breckland farm.

Photos: Eastern Daily Press



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Amenity is being given special consideration and certain woods are to be managed on the "Selection System", so avoiding clear felling at any time. Modern techniques are being used throughout and there is little doubt that the whole scheme is an outstanding example of an imaginative and vigorous treatment of what was a difficult problem.

A happy estate

Any review of Sandringham Estate would be incomplete without some indication of Queen Mary's interest in it. For over fifty years she was a familiar figure around the villages. She was always visiting the cottage tenants, especially the old and infirm; she visited the village schools and in fact took a deep and human interest in the whole life of the district.

Little has been said in this article about tenanted farms. They are not a big problem, however, because although they cover some 13,000 acres, they are almost all big farms averaging only a little under a thousand acres each. Most of them are equipped with substantial premises and although there have been alterations and improvements—and there is always a programme of work to be carried out—there is nothing of special interest to review. The large number of cottage properties, and the way in which successive generations of our Royal family have provided for the widows and pensioners—indeed every one of their employees and families—means there is always a great deal of maintenance work to be done.

The organization of the estate office is extremely economical. Captain Fellowes has been agent since 1936, and he is assisted by the Chief Clerk, Mr. J. Pillar, who has been at Sandringham twenty years, three clerks and two pupils. The three main departments are Clerk of Works, Farm Manager, and Head Forester. There are Head Keeper, Head Gardener and Head Watchman and, in all, some two hundred employees. The thirty-three building workers include some really fine craftsmen. The estate yard is closely linked with the sawyard (employing five men) and forestry, which now has twenty-seven workers. The increase in forest labour presented a housing problem, but this was solved by turning the very large old farmhouse, Flitcham Hall, into two flats and a hostel which houses five employees.

The provision of housing for workers past and present is on an exceptional scale, and so is the pension scheme. It is really not surprising that with such exemplary conditions of employment, labour relations are exceptionally happy. It is unusual for a man once employed on the estate to leave it. It is

Farm Buildings of Norfolk (Article on pp. 166-70)

(left to right)

Waxham barn, built c. 1170.

Flint pebble barn, Letheringsett, N. Norfolk.

Mulbarton barn: brick and slate with Dutch gable end.

Clay lump and thatch buildings, S. Norfolk.

Glandford barn: flint cobble and pantiles

Modern multi-purpose barn.

Photos: E. B. Mumford

much more probable that his son will join the staff too. The estate is particularly self-contained. All the repair work to buildings and most of the new work is done with estate labour, although contracts are let for major building projects such as new cottages. There is an up-to-date machinery workshop which deals with all repairs and maintenance to farm and estate vehicles.

Sandringham is a live estate and it is developing in every way. It is a grand example of good ownership which, through the policy and interest of its successive owners, combined with the professional skill and efficiency of the heads of the estate staff, gives the lie to the cry that the English country estate is on its way out.

The writer wishes to acknowledge the kindness of Her Majesty the Queen for giving her gracious consent to the publication of this article. He also wishes to acknowledge the detailed help and advice of Captain W. A. Fellowes, C.V.O., F.L.A.S., and his staff, without which the preparation of the article would not have been possible.

Norfolk Farming in Transition

K. J. ALLISON, B.A., PH.D.

Contrary to what is commonly supposed, the rise of Norfolk Husbandry was apparent in the seventeenth century and not the result of any "agrarian revolution" engineered by Townshend and Coke.

HISTORIANS used to suggest that English farming underwent a revolution during the eighteenth century, but we know now that there was no rapid change, no sudden introduction of new methods—in fact, no revolution. Credit for the "revolution" in Norfolk has hitherto been given to "Turnip" Townshend, who retired to his Norfolk estates in 1730, and, especially, to Thomas William Coke, who inherited his estates in 1776. But these gentlemen did not initiate the famous Norfolk Husbandry; Coke did not bring wheat cultivation to north-west Norfolk, nor did Townshend introduce the turnip. Rather, Townshend and Coke developed and systematized the use of new methods and crops which had already been employed in the county for many years. Credit for the introduction of new practices must be given both to the landlord predecessors of Coke and Townshend, and to many small tenant farmers; but this view in no way lessens the importance of the role of, above all, Coke of Norfolk in developing and popularizing the Norfolk Husbandry. The myth of a sudden revolution in the eighteenth century must be replaced by the reality of a gradual transition during the seventeenth century from the medieval open-field husbandry, to the new Norfolk Husbandry, which Coke was eventually to endow with fame and popularity.

Open-field husbandry

The medieval open-field husbandry of Norfolk differed from that practised elsewhere in England. It was adapted to conditions in which light or medium soils predominated over about two-thirds of the county, and its basis was the frequent dunging of the arable land by large flocks of sheep, without which

those soils could never have achieved their reputation for the cultivation of barley. The marriage of corn and sheep was made possible by the unique Norfolk foldcourse system, and it is necessary to understand the main features of the system in order to appreciate the significance of the changes which it was to undergo during the seventeenth century.

Little enclosure had taken place in the open fields before the seventeenth century. Each tenant's holding was composed of numerous strips of land which lay scattered and intermixed with the strips of his neighbours, as well as those of his landlord the lord of the manor. In the absence of fences, all landholders enjoyed important rights of commonage for their beasts over the open fields whenever these were unsown. Beyond the limit of the cultivated fields, extensive heathland and commons provided valuable pasturage all the year round. The open fields and heathland of a village were divided into a number of foldcourses, each belonging to the lord of a manor and within which the lord's flock might be fed. The heathland was used by the sheep throughout the year, but the flock moved on to the arable land within the foldcourse whenever it was unsown. Thus the lord's sheep were entitled to feed on his tenants' strips in the fields whenever they lay fallow in summer and throughout the winter months.

The foldcourse system offered undoubted advantages to landlord and tenant alike. In the cultivation of corn crops, tenants reaped the benefit of dunging by the lord's flock. The chief corn crop was barley, and large quantities were available for export from the county after local needs had been met; but wheat was grown in smaller quantities throughout Norfolk, except perhaps on the marginal sands of the Breckland. Incidentally, the belief that Coke introduced wheat to north-west Norfolk is quite unfounded: although he greatly extended its cultivation, it had been grown in Norfolk for centuries before 1776. At the same time, the foldcourse system enabled landlords to run large flocks of sheep; their wool satisfied the entire demand of the Norfolk worsted industry until the end of the sixteenth century, and large supplies of mutton were sent as far afield as London, long before turnip-fattened mutton became so important in the eighteenth century.

Changes in the seventeenth century

From the early seventeenth century onwards, the traditional open-field husbandry was subjected to a number of disruptive innovations introduced by small tenant farmers. These tenants had always been bound by a rigid system of cultivation and fallowing, in which they were obliged to lay bare their land at regular intervals for the benefit of their landlord's flock of sheep. The rotation which they followed was simple and wasteful: spring-sown barley-winter sheep feed on the stubbles-summer fallow for sheep feed-and winter wheat or rye. But the irksome customary restrictions of the foldcourse system were increasingly ignored by tenants who sought to deny to the landlord his sheep feed on both summer fallow and winter stubbles. By enclosing their strips in the open fields, tenants were able to reserve such feed for their own cattle. Tenants also ignored the practice of sowing spring corn and winter corn in blocks, and of leaving compact areas fallow, which had always facilitated the movement of the lord's flock over the unsown land in the open fields.

The piecemeal enclosure of land by tenants became more and more popular during the seventeenth century, and threatened to disrupt the foldcourse system in many villages. At first, some landlords tolerated tenants' closes provided they were opened to the lords' flocks after harvest. But such "half-year closes" were gradually converted to "whole-year lands" from which the sheep were permanently excluded. Tenants thus gained freedom from open-field and foldcourse restrictions and were enabled to introduce improved methods of cultivation on their enclosed land. The most important innovation was the introduction of turnips as a field crop.

The cultivation of autumn-sown turnips was incompatible with the traditional foldcourse system, for land no longer lay unsown for winter sheep feed, and small-scale enclosure by tenants often went hand in hand with the introduction of turnips. Far from being an eighteenth-century introduction by Townshend, turnip cultivation as a field crop began in the first half of the seventeenth century; turnips appear to have been first grown in Norfolk as a garden crop around the city of Norwich by Dutch refugees who arrived there in 1565. Many landlords fought hard to maintain their flocks in the face of enclosure and turnip cultivation by tenants. An uneasy balance was sometimes achieved whereby tenants agreed to sow turnips in compact blocks so that the progress of the flocks was hindered as little as possible, and turnip closes were often opened to the lords' flocks as soon as tenants' cattle had finished feeding on the roots. By such agreements, the disruption of some foldcourses was delayed until as late as the second half of the eighteenth century.

Large-scale enclosures

While some landlords resisted enclosure and turnip cultivation by their tenants, others introduced the new methods on a large scale and completely reorganized their estates during the second half of the seventeenth century. The traditional Norfolk open-field system was displaced by large-scale enclosure. The arable open fields were divided into closes, and the extensive heaths were enclosed as "brecks" which were cultivated at intervals of several years. Large flocks of sheep no longer fed on unsown fallow and stubbles. With turnips and sown grasses playing an important part in the cultivation of the arable closes, sheep were fattened on fodder crops to meet the ever-growing demand for mutton.

Such extensive enclosure was accompanied by the formation of large compact farms which were leased to tenant farmers. This reorganization of estates is best illustrated by the work of a number of big landowning families, including those of L'Strange and Coke, in north-west Norfolk. Thus the landlords of the late seventeenth century must take much of the credit for the innovations which have usually been attributed to their successors; in fact, extensive work had been carried out on the Coke estates during the hundred years before Thomas William Coke inherited them.

It is clear from the points already considered that the seventeenth century witnessed important changes in Norfolk farming. Piecemeal enclosure and turnip cultivation by tenants, and wholesale enclosure and estate reorganization by landlords marked a gradual transition from the old open-field hus-

bandry; extensive enclosure, the development of turnips as a field crop, the fattening of sheep on turnips and other fodder crops, the establishment of large compact farms leased to tenant farmers—all these were important constituents of the new Norfolk Husbandry of the eighteenth century, and all had been introduced during the seventeenth.

Other elements of the new husbandry, such as the introduction of clover, sainfoin, and ryegrass into the rotation, had been established before the end of the seventeenth century. Marling had been practised even earlier, and Scottish cattle were being brought into Norfolk to be fattened on turnips throughout the second half of that century.

The new husbandry

The changes already made in the seventeenth century show that we must not speak of an eighteenth-century "agrarian revolution" in Norfolk; still less should the last quarter of the eighteenth century (Thomas William Coke's period) be regarded as the most important period of innovation. But, of course, the new methods begun during the seventeenth century were greatly extended during the eighteenth, and the lead was taken by such landowners as Coke and Townshend.

The extension of the new practices proceeded throughout the eighteenth century. Leases on the Coke estates were increased in number and length, and the giving of twenty-one-year leases became a general practice there in the 1720s. The terms were progressively extended and elaborated, and tenants were bound more and more strictly to a careful rotation of crops. The greatest advance in this direction was certainly made in the last quarter of the century, and it is here that the true importance of the work of Thomas William Coke is to be found. In about 1800, his development of the terms of leases culminated in the absolute prohibition of the growth of two white straw crops in succession. Coke made many other contributions to the popularization of the new Norfolk Husbandry. He established Southdown sheep and the Devon breed of cattle—both far superior to the old Norfolk stock; he spread new techniques of draining and cultivation and new methods of fertilization. The exposure of the eighteenth-century agrarian revolution as a myth has in no way diminished the importance of the work of Coke of Norfolk. As Parker² says, "Coke's reputation as a landowner could safely have rested on his part in introducing or disseminating knowledge of these innovations; there was no need for writers of his day and later to praise him, and mislead historians, by making him a worker of miracles, who brought fertility to a sandy waste."

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Readers interested in the work of Thomas Coke may like to refer back to C. W. Rowell's article on Holkham, in the April 1956 issue of AGRICULTURE.—Editor.

The Country Landowners' Association 1907-1957

THE EARL OF BRADFORD, T.D., D.L.

ON July 3rd, 1957, the C.L.A. celebrates its fiftieth birthday. Though it has changed its name twice in the course of its life, it has always retained the familiar initials "C.L.A." Moreover, in spite of conflicting pressure, it has always followed two of the guiding principles of its founders: representing agricultural and not urban interests, and contriving to remain a non-party body.

For the first ten years of its existence, when it was known as the *Central Land Association*, it endeavoured to represent the interests of all connected with the land, whether as owners, tenant farmers, agents or workers. It was then primarily concerned with improving the position of the industry and strengthening the political influence of agriculture, following years of depression resulting from imports of cheap food. At that time, the Association was predominantly supported by large landowners. It was not until 1918, however, when the C.L.A. changed its name to the *Central Landowners' Association*, that it came to represent exclusively the interests of owners of agricultural land—owner-occupiers as well as landlords. The Farmers' and Workers' Unions were by then well established, and an organized body was essential as spokesman for the landowners.

The word "Central" in the Association's name signified that it was the co-ordinating body for local views; in its first phase, there had been only five local branches, of which those in Yorkshire, Devonshire, and Gloucestershire were the strongest, but in the early 'twenties, after the C.L.A. was reconstituted, local branches were formed in most of the counties of England and Wales. The Scottish landowners formed their own organization a year before the foundation of the C.L.A.

Work in a national context

From very modest beginnings, the Association has now grown into a body 32,000 strong, with active and flourishing branches, and a firmly-established reputation for statesmanship. It has always prided itself upon taking the broad view of problems in their national context, rather than defending a purely sectional interest. On this its prestige has been built and its achievements won. In order to clarify its representation of the rural interest, it changed its name again in 1949 to the *Country Landowners' Association*.

Its work today is well known throughout the agricultural community; with the recent increase in complex legislation affecting the land, the growth of owner-occupation, and the diminishing size of estates accompanied by the virtual disappearance of the resident agent, it is fulfilling a very real need

as guide, philosopher and friend to the rural landowner. It advises him on his manifold problems, whether legal or technical, looks after his interests in Parliament and Whitehall, and negotiates with other organizations on his behalf. From C.L.A. panels, representative landowners are chosen to sit on County Agricultural Executive Committees and Agricultural Land Tribunals; prominent landowners connected with the Association are to be found serving as the Minister's personal Liaison Officers with his County Committees, on agricultural and forestry advisory committees, and on other Government committees investigating a variety of agricultural matters. In fact, the C.L.A. is an integral part of the present agricultural set-up; if it did not exist, it would surely have to be created! For this is an era of highly organized activity and negotiation; without a Trade Union, the individual is helpless.

Rural landowners are a highly individualistic section of the community, and it was force of circumstance which pushed them, in the early part of the century, to combine and press for a place in the sun for British agriculture, then suffering from several decades of political neglect. The only body which looked after the agricultural interest in Parliament at that time was the Central Chamber of Agriculture, but it was never a strong political force; farming was swamped by the much more noisy urban and industrial interests.

Personalities

Among the C.L.A. founders were two ex-Presidents of the Board of Agriculture and Fisheries (not yet elevated to the dignity of a Ministry)—Mr. Walter Long, later the First Viscount Long of Wraxall, whose tenure at the Board was marked by his firm measures to stamp out rabies in this country, and the Fourth Earl of Onslow. The former was President of the C.L.A. for the first ten years of its life, and the latter was the first Chairman of the Executive Committee. They had Mr. Ailwyn Fellowes, later Lord Ailwyn—another ex-President of the Board, and a member of the C.L.A. Executive Committee—had inside knowledge of the extent to which agriculture was a political Cinderella. They soon saw to it that pressure was brought to bear by the C.L.A. on the Government to improve the status of the Board, and to provide for a junior Minister to be answerable for the Department in the House of Commons when the President was a peer. Mr. Asquith, then Prime Minister, received a C.L.A. deputation to press these views in December 1908, and a Bill to give them effect was passed the following year.

Thus links between the Ministry and the C.L.A. have always been close. Among later Presidents of the Board prominent in the Association at the end of the First World War was the Second Earl of Selborne, and among Parliamentary Secretaries were Sir Edward Strachey, Mr. F. D. Acland, Lord Clinton, Lord Bledisloe, Lord Feversham, and—in more recent times—Lord Carrington and Lord St. Aldwyn. Lord Bledisloe and Lord Clinton, both of whom are founder members of the C.L.A., are happily still alive at this time of its Golden Jubilee, and have watched it grow in strength and influence to fulfil the aims of its founders.

The C.L.A. in action

Not everyone was in favour of the C.L.A. when it was first started. A contemporary leader in *The Estates Gazette* voiced the views of the urban property interests that the new body should not be exclusively rural in its representation. The property interests, it said, "are threatened in almost every particular, and it is no longer feasible to attempt to defend them by a number of straggling corps acting upon their own initiative and arousing the derision rather than the respect of their opponents. The time is now more than ripe for the creation of a great body which shall enjoy at once the advantage of numbers and of a bold and definite plan of campaign."

But the C.L.A. never set out to be, and never has become, a mere property defence organization. It had considerable provocation to move in this direction during its early years, when the more radical elements of the Liberal party, then in power, openly favoured the nationalization of the land, and advocated penal taxation, which was to play so great a part in the break-up of the large estates during the next fifty years. The non-party flavour of the Association was at the same time a source of both strength and weakness; there were equal numbers of M.P.s of both Conservative and Liberal parties on the original Executive Committee. So the Association could not openly attack Government policy at the time of the agitation of 1910-11 over the taxation of land values, when political feelings were running high, and Lloyd George, as Chancellor of the Exchequer, was making strong speeches about landowners. Nevertheless, it was Lloyd George who, in 1910, accepted the important principle of the maintenance claim as regards the taxation of agricultural estates. That concession, wrung from him by the C.L.A., has saved the industry many millions of pounds.

Another financial campaign in which the C.L.A. met with success was that for the total de-rating of agricultural land and buildings, between the two wars, when the industry was in the throes of depression. In this case, the Association joined forces with the Farmers' and Workers' Unions, and achieved the objective by stages. A third vital financial concession—the capital expenditure allowance of the 1945 Income Tax Act—was won by the C.L.A. on its own initiative. And it has successfully fought a series of rearguard actions since 1919 to prevent increases in the rate of death duties on agricultural land. Nevertheless, capital has been steadily drained away from the industry in death duties at the rate of about £2-£3 million a year. Perhaps it is a sort of rough justice to the landowner that the Government should be offering capital improvement grants for farm equipment in this Jubilee year of the C.L.A.!

Capital investment and the new landowners

Apart from leaving a legacy of arrears of farm improvements to be tackled, the drain of capital from the land in the form of death duties has brought about striking changes in the pattern of landownership in this country. Comparatively few of the great estates now remain; the number of farmers who both own and work their land in England and Wales has risen from 11 per cent in the early years of the century to about 40 per cent today. That means, in effect, that the capital available is more thinly spread over a greater

number of farm units. Many owner-occupiers have bought their farms on a mortgage, which is the first charge on the land; the responsibilities of maintenance are unfamiliar to them. Not the least of the problems created by these changes has been that of the management of small acreages of woodland, in which the average farmer has little interest, apart from cutting such timber as he requires for his own use. And, at present anyway, he has little incentive to take more interest in forestry, or even in hedgerow timber.

With the enormous increase that has taken place in building costs over the last few years, and the reluctance of many builders to undertake work on remote farms, coupled with the disappearance of the craftsmen who formed the backbone of the old estate staffs, many owner-occupiers feel disposed to undertake as much building work as possible themselves, with the help of their workers. This, and the new Farm Improvement Scheme, have created an unprecedented demand for technical advice, which the A.L.S. will find themselves hard put to it to satisfy in the next few years. But this revival of interest in fixed equipment and the contribution it can make to efficient production is long overdue.

Investment of capital in buildings which may last thirty or forty years is a very long-term and rather risky business; risky, because changes in agricultural practice and requirements and the technicalities of building construction are now taking place so rapidly. A building may well be out of date before it wears out. The investment of money in fixed equipment calls for a high degree of confidence, not only in the future prosperity of farming in this country, but also in the political stability of private landowning. The years of agricultural depression and political apprehension of land nationalization have taken their toll of farm equipment, and we are now faced with the bill to make it good.

Already many millions of pounds have been invested in fixed equipment by private landowners since the last war, both without any grant-aid at all, or making use of such grants as have, up to now, been available. I am convinced that the new Farm Improvement Scheme will give a great stimulus to this activity on the part of both landlords and owner-occupiers.

Today's problems

Among the other big matters with which the Association is now actively concerned are the problems of how to make landowning and private forestry pay, and of how to amend the tenure provisions of the 1947 and 1948 Agricultural Acts. Since the war, the C.L.A. has spent much time and thought on the question of farm rents, which have lagged far behind increases in costs and farmers' prices. Until quite recently, the average level of rents per acre in England and Wales was actually below the average of the 1870s, according to joint surveys of farm rents made by the Ministry and the C.L.A. The traditional level of farm rents at a figure around 30s. an acre, and the traditional 5 per cent charge on the capital cost of improvements, have become so ingrained in the countryside that it is difficult to change the climate of opinion as to what constitutes a fair and economic rental in modern times. Indeed the whole conception of treating landowning as a business rather than a pleasant and rather expensive hobby, is novel. But the days of the

dilettante have gone, and the C.L.A. realizes that unless private landowning is placed on a firm economic basis, the system will collapse.

Then the landlord-tenant relationship must also be placed on a satisfactory basis. Throughout the century there has been a gradual whittling away of the landlord's powers to determine who should farm his land, and consequently of his ability to enforce good husbandry, which is one of his major obligations. There is widespread agreement that the principle of security for the tenant farmer has now been carried too far, as if all disciplinary powers of the landlord are removed, the slack tenant has little incentive to farm well. So the Association has been trying to devise some means whereby the good farmer may have reasonable security, while the indifferent farmer may be given notice to make way for the queue of well-qualified young men anxious to obtain farms.

With all these problems, and many more, on its plate, the C.L.A. is striving to serve the interests not only of its own members, but of agriculture as a whole. The system of private landownership has a great and valuable contribution to make to our agricultural economy, and as the C.L.A. sets out on the way to its centenary, it does so with pride in its past achievements, and confidence in the future.

The Yorkshire Agricultural Society The One Hundredth "Great Yorkshire" Show

SYDNEY MOORHOUSE

In the last twenty years the Yorkshire Agricultural Society has celebrated two centenaries—in 1938, at Doncaster, the hundredth anniversary of its foundation and now, this year, on the permanent showground at Harrogate, the Society's hundredth show. The explanation lies in the fact that no shows were held during the two world wars and on those occasions when the R.A.S.E. visited the county.

It is perhaps no mere coincidence that both the Great Yorkshire Show and the Royal should be associated with the fertile mind of the third Earl Spencer, for it was he who, within two months, made speeches that were directly responsible for the inauguration of both sponsoring bodies. Presiding over a meeting of the leading Yorkshire agriculturists at the Black Swan Hotel, York, on 10th October, 1837, he proposed that a society be formed "to hold an annual general meeting for the exhibition of stock, implements, and so on, and for the general promotion of agriculture". On 11th December of the same year, at the annual dinner of the Smithfield Club, in London, he

remarked that "If a society were established for agricultural purposes exclusively, it would produce essential benefits to the British farmer".

The Yorkshire Agricultural Society came into being on the night of Earl Spencer's proposition and held its first show at York the following year; and in May 1838 the English Agricultural Society, forerunner of the Royal Agricultural Society of England, was formed. Appropriately, the Earl was the first president of both societies.

At the York meeting, the Yorkshire Agricultural Society elected as its vice-presidents—two from each of the three Ridings—the Earl of Carlisle, Sir Tatton Sykes, the Duke of Leeds, Lord Feversham, the Earl of Harewood, and Earl Fitzwilliam, all of whom were prominent landowners and agriculturists in the county.

Naturally, the classification at the earlier shows was quite different from that of today, and for a time the only distinct breed of cattle catered for was the Dairy Shorthorn. This is not surprising, for Yorkshire had always been one of the great strongholds of the breed. As long ago as 1400 there is a record of one John Percy, of Haram in the North Riding, bequeathing to his son "two stots with short horns", and three hundred years later the short-horned cattle of the Holderness area were already attracting attention for their dual-purpose propensities.

Yorkshire also played a great part in the production of the first Coates's Herd Book. The original idea came from Sir Henry Vane Tempest, member of one of the county's oldest families. George Coates, the compiler, was a native of Smeaton, in the North Riding, and Jones Whitaker, of Otley, was responsible for publishing the initial volume. And, of course, Earl Spencer was a noted Shorthorn breeder, his famous bull, Wiseton, winning many prizes at agricultural shows.

Shorthorns: Bates-Booth rivalry

The time of the first Great Yorkshire show, however, coincided with the period when the rivalry between Thomas Bates and John Booth was at its height. Bates, who lived at Kirklevington, is generally regarded as the originator of the modern Dairy Shorthorn, and two of the breed's most famous families, the Wild Eyes and Foggathorpe, have intimate connections with the county. The first family arose from a calf bought by Bates for £3 on a farm where Middlesbrough now stands; the founder of the Foggathorpes came from the Market Weighton area.

John Booth, who farmed farther north, was, on the other hand, more concerned with developing the beef propensities of the breed. Both had founded their herds on stock bought at the Collings' dispersal sales.

Bates had early expressed his dislike of showing and had once written: "By extra feeding the worst of animals may be forced forwards to gain the applause of incompetent judges. How the animals had been fed was never told." He was, however, persuaded to overcome his prejudice sufficiently to send seven animals to the pioneer Yorkshire show, these including the bull, Duke of Northumberland, with which he was to win at the first Royal the following summer. In all, he gained four first prizes and one second, but even so he claimed he had been unfairly treated by the judges! Nevertheless,

he continued to support the Great Yorkshire and in 1841, after his famous cow, Oxford Premier, founder of the noted Oxford family, had been beaten by Booth's Necklace at the Royal, he turned the tables on his rival by winning most of the classes. The following year Booth brought Necklace again, but once more Bates won, this time with Duchess 34th, a daughter of Duke of Northumberland, in a class of fifteen strong.

Thomas Bates had always advocated that pedigree should be taken into consideration when judging, but he failed to impress either the Yorkshire or the Royal officials with his arguments. In Yorkshire, however, he had a strong supporter in Mr. F. H. Fawkes, of Farnley Hall, Otley, who in 1847 addressed a letter to the President and Council of the Yorkshire Agricultural Society proposing that only females that had produced calves should be eligible for the Society's premiums. In the case of yearling bulls, he advocated that each must have a certificate to the effect "that cows are holding to him", and that no bull of over two years of age should be qualified unless "he is the sire of twelve live born calves".

Such ideas, however, were too revolutionary for the show authorities of 110 years ago, and the Yorkshire Agricultural Society turned down Mr. Fawkes's suggestions.

Developing interests

Shorthorns continued to dominate the cattle lines at the Great Yorkshire until the close of the century, but in 1842 classes for "Cattle—Any Breed" appeared in the schedule, and then in 1872 the Channel Island cattle came into the classification to be supplanted by Jerseys in 1884. Guernseys first appeared in 1896, but after three years the classes were dropped until 1927, dropped again in 1929, and finally reappeared in 1931. The Jerseys, too, failed to achieve a continuity, being absent from the schedule from 1920 to 1926.

In 1889, Aberdeen-Angus appeared for the first time and have been included ever since, and the dates of the introduction of the other breeds still included were: British Friesians, 1921; Dairy Shorthorns, as distinct from the beef type, 1922; Ayrshires, 1923; Red Polls, 1934; Beef Shorthorns, specially named as such, 1949; Herefords, 1949, and Northern Dairy Shorthorns, 1953. Among other breeds which have made brief appearances have been Blue Albions, Kerries, and Welsh Blacks.

Interesting features of some of the early shows were the "matches" arranged by some of the exhibitors after the main judging had taken place, and Mr. F. H. Fawkes figured in one of these at the Northallerton show of 1840 when he matched his bull, Sir Thomas Fairfax, against one, Clementy, owned by Mr. R. M. Jacques. This was for £5 a side, with side bets, and Mr. Fawkes's exhibit was declared the winner.

Sheep have always been a strong feature of the Great Yorkshire, and here the first breed to be mentioned by name was the Leicester Longwool, of which the East Riding has always been a stronghold and which appears in the 1838 classification. The Leicester has always had a close link with the Yorkshire woollen industry, and today the Bradford Chamber of Commerce continues to offer a special prize for the best animal of this breed in which the wool alone is taken into consideration. The mountain breed, the Wood-

land and Penistone, of which there are a few flocks in the High Peak of Derbyshire, made a brief appearance in 1856 and again in 1880, and in the first of these years the Yorkshire breed, the Wensleydale, another long-wooled sheep, was included and has been catered for ever since.

Pigs also appeared at that pioneer 1838 show but were merely divided into two sections, large and small breeds. Poultry came two years later, and from the first there were classes for agricultural stallions and draught horses, and, among the lighter breeds, for road, coaching, and hunting horses.

Permanent showground

From its inception and right up to 1950 the Great Yorkshire continued to perambulate the county and visit the various large towns and agricultural centres in turn, but in 1951 the Society moved to its permanent showground at Harrogate and became the first of the big county shows to have its fixed home—now perhaps the finest showground in the country.

The main ring, with grandstand accommodation for 6,000 and grass banks enabling thousands more to watch the proceedings in comfort, has been widely and justifiably praised. The cattle sheds, installed at a cost of some £50 per beast some three years ago, have since been supplemented by good accommodation for horses. Permanent buildings provide quarters and recreational facilities for stockmen. The last of the wooden sleeper tracks—with all their bumpiness and hazards in wet weather—disappeared after the 1955 show and there are concrete roads everywhere.

Sir John Dunnington-Jefferson, who has been Hon. Director for twenty-four years, holds the view that a county agricultural society has its duties to perform in the fields of research and education, and these are being fulfilled admirably. Four years ago, the Ministry of Agriculture took over the tenancy of a five-acre site on the ground, and the outcome is the staging of a series of demonstrations of high practical value and which, of course, can be visited at other times of the year.

The Forestry Commission can also stage effective demonstrations which carry on from one year to another and thereby strike a much more realistic note than is usually possible at an agricultural show. Here a five-acre stretch of woodland, planted in 1860 with oak, beech, birch, Scots pine, and European larch is used, and the public have admission to several paths. In 1951 (the year in which the Society came to the ground) the over-mature trees were removed and the large gaps left planted with various light-desiring species, while in other places there was under-planting with shade-loving species.

Progressive from the outset, the Yorkshire Agricultural Society continues to fulfil adequately the very ideas which were in the mind of the third Earl Spencer, when he addressed that inaugural meeting in York 120 years ago.

Month in the Forest

J. D. U. WARD

Brashing—Beech—Sand-blow—Birds

JULY resembles June (and August) in being a month when an eye must be kept on weeds likely to smother recently-planted small trees, and even those which have been established two or three years. As every farmer knows, it is often a question of judgment or experience when weeds are best cut. A little too soon and, some weeks later, you may have to make a second round which might otherwise have been omitted; a little too late, and the weeds may have done damage, if only the hiding of miniature trees so thoroughly that work becomes a headache as well as a sweat.

Brashing is another job for July. Brashing means removing the side branches of trees (usually trees aged between ten and fifteen years) to a height of six feet. Actually, this is not a strictly dated seasonal task, but it is generally considered best not to cut trees when the sap is most active; that is, roughly, not in spring and not just before or during leaf-fall. Most people understand that the cutting of branches, whether by saw, billhook or pruning-chisel, should be clean against the main stem (no "hat-pegs", please), but I do not think enough is made of brashing *upwards*—that is, making the cut or blow in the direction of growth. This sometimes requires a little extra care, but it makes a cleaner job if done well and injures the tree less. It is, after all, a considerable "surgical operation". By the way, if you must lop a pet walnut, July is the least bad month for the job.

Neither as a tree nor as timber is beech normally of much interest to farmers. In some places it used to be the main source of fuel, but untreated beech does not stand up well to outdoor exposure. But in silviculture, beech is extremely important. It is a shade-tolerant tree and has been called the mother of the forest because its rich leaf-fall makes it a soil-improver, especially when it is grown in mixture. As for the timber, there is no end to its uses—from furniture to plywood (sometimes for aeroplane construction) and from butter-casks and the heels of women's shoes (of which millions are made of beech) to brush-backs and toys. The tree flourishes on chalk and limestone (perhaps nourishing the finest "show" stands of beech), on acid, rain-drenched soils and even on the hungry arid sands of Breckland. I think I am right in saying that the longest deliberately planted avenue of trees in England is of beech, established with the aid of birch nurses about twenty years ago in North Suffolk. This is Queen Mary's Avenue, four miles long in the King's Forest (about 6,000 acres), which was so named to mark the jubilee year of 1935.

South of the King's Forest is Rendlesham Forest (nearly 5,000 acres), and to the north (most of it in Norfolk) is Thetford Chase (50,000 acres). These three forests are worth remarking as major exceptions to the general rule that Britain's twentieth-century forests are on the western side of the island, and composed mainly of Sitka spruce and other N.W. American moisture-

loving trees. The forests of the Eastern counties, where annual rainfall is of the order of 22-26 inches, are composed mainly of quite different trees, Corsican and Scots pine predominating. It is these spruces, sometimes denounced as dreary, which have excited so many protests about monotony, despite the fact that much care has been taken to diversify roadside margins with belts and mixtures of broad-leaved trees—poplars, beech, oak, and others. Actually, the creation and development of Thetford Chase out of what was mainly unproductive and near-desert land, is a magnificent achievement. Of course, so large a forest was not made without ruffling the feelings of some people, and indeed one may sympathize with them, for some magnificent pioneer farm work has also been done within the same area.

The Thetford Chase to Rendlesham Forest area is one of the very few in Britain where sand-blow is a major obstacle to the establishment of forest trees. Visiting the district in 1677, John Evelyn, the well-known pioneer of forestry, wrote of "the Travelling Sands, that have so damaged the country, rousing from place to place, and like the sands in the Deserts of Lybia, quite overwhelmed some gentlemen's whole estates". Now this nuisance has largely been controlled, partly by afforestation; but on a limited scale the sharp particles of sand are still sometimes blown so that small tree-stems are cut at the collar so causing heavy casualties in some nurseries. Wind-breaks or shelter-belts offer the best hope, and here may be seen those "odd-looking" fences of contorted Scots pines which themselves form at least the nucleus of a shelter-belt.

One minor, almost non-utilitarian, point merits a mention. In this bird-loving age complaints are often made about the birdlessness of the pine plantations. Compared with open broad-leaved woods, dense pine plantations are usually birdless. But compared with desert-like Breckland before afforestation, the pine plantations are ornithologically rich. Counts made before and after indicate that planting has increased the bird population by 200 per cent. But this may not please all farmers, some of whom hold views which might be briefly summarized: "I am not really against birds, and I realize that some do a lot of good. But on the whole I think that Britain has rather too many".

★ NEXT MONTH ★

Some articles of outstanding interest

WORK STUDY AS AN AID TO MANAGEMENT by E. S. Carter and S. H. Read

HUSK IN ADULT CATTLE by J. F. Michel

LIMITED SELF-FEEDING OF SILAGE by F. W. Jameson

GUERNSEYS DEHORNE by Tom Billington

Farming Affairs

Talking about poultry

Now, more than ever, the major shows are of importance to farmers. Here in one arena can be seen the latest machinery and equipment side by side, enabling the farmer to get some idea of technical advances and the possibilities of more efficient output in the future. What may the poultryman find, and indeed what should he look for? There are many advances in the electrical field which can help, especially with brooding. Another subject worth looking at is water supplies and the new types of plastic hose with connections which enable the job to be done simply with farm labour. Both these items can reduce labour costs and help efficient production. However, the majority of poultry-keepers will be interested in more efficient housing for their layers, and, of course, the emphasis will be on intensive housing. I am often asked whether a man should go in for batteries or deep litter, and without a very careful study of the farm and circumstances, it is not possible to give a sensible answer. The one trend I have noticed is that the self-employed man tends to go for batteries in the hope of benefiting from the general increase in efficiency, whilst the man who employs labour is tending to go for deep litter, feeling that where he loses a little on efficiency he gains very much more on reduced labour charges with large units.

These remarks apply mainly to deep-litter houses but also to battery units. I get the idea that, with the expansion of the poultry industry, some people are making houses with little experience of what is needed. The essential point is to look at the house with the idea of working in it; not to be impressed by fiddling gadgets, but to pick units that will yield the best return on minimum labour. This does not mean that the cheapest house is the best buy in the long run, and points to bear in mind are as follows: How do you clean it out? Can you get new litter in and the old litter out? Can the eggs be collected and the food given out without walking further than is absolutely necessary? Is there an automatic water supply and, if so, has provision been made to collect the drips which so often damp the litter? Is the ventilation adequate, and will the house which looks so well in the summer sunshine stand up to the rigours of winter work? To my mind, it is essential to have roof insulation and a positive ventilating system. If we take a 1,000 birds as an example, it would be possible to buy a well-insulated house which could be delivered and erected on foundations which the farmer has prepared, for something like 5s. a square foot, and above this I would allow another 5s. per bird to cover the fittings.

In short, will it work off the show ground? Don't be impressed by gadgets, and remember also that every hinge has a number of screws which many poultry farmers can ill-afford the time to replace.

C. T. Riley

Wood-pigeon control by nest destruction

The idea that nest destruction might provide a method of controlling the wood-pigeon population has recently received some publicity and a consider-

able amount of research has been done on this subject during the last three years. An intensive breeding survey carried out during 1955 in Cambridgeshire confirmed previous work by Colquhoun in showing that the wood-pigeon has a long breeding season, lasting from April to November. In addition, the very important observation was made that 70 per cent of the young birds which left the nest did so in July and August. Mortality of eggs and young was found to be very high; 80 per cent of the eggs laid failed to produce flying young, predation being by far the most important cause of death. Of the young hatched at any time during the breeding season, the proportion that died decreased throughout the season, so that more young were fledged later in the year. Marked variations in breeding density and breeding success were found in different habitats.

From the 1955 results it seemed possible that an intensive nest destruction operation in July and August might effectively check successful breeding. In 1956 a series of three nest destruction trials was carried out to test the practicability of such an operation and to find out how many man-hours would be required. Although some further experiments are needed, it now seems probable that two periods of nest destruction, if done at the right time and on a big enough scale, might largely prevent successful breeding.

In the 1956 trials nearly 400 acres, comprising four different nesting habitats, were treated experimentally. The habitats were hedgerow, deciduous thicket, mature deciduous woodland, and coniferous woodland. The density of occupied nests varied between habitats; hedgerows supported the highest population, deciduous woodland the lowest. Differences in the density of nests and the difficulty or comparative ease of searching different habitats caused wide variations in the time taken to deal with unit areas. For the second nest destruction, fewer man-hours were required because a smaller proportion of unoccupied nests had to be dealt with (empty nests remaining from previous years had been cleared during the first trial).

A total of 5,262 occupied nests were destroyed during the three periods, comprising 2,804 in the first trial, 2,307 in the second and only 151 during the third. The low total for the last trial coincided with the end of the breeding season, and it could well be omitted.

For the first two trials, the average times taken to clear one acre were 2.7 and 2.2 hours respectively, making 4.9 hours per acre per year. In the first trials, the times for hedgerow, deciduous thicket, deciduous wood and conifer wood were 4.6, 2.1, 1.7 and 2.2 hours respectively. They were less in the second trial—3.5, 1.8, 1.5 and 2.1 respectively. The average time required to clear one acre in the third trial, when few nests were present, was 1.4 hours. In the first two trials the average time required per nest was 0.4 man-hours, and there was little variation between habitats. In the third trial the time per nest was high—3.2 man-hours.

Certain aspects of nest destruction need further investigation, and more experimental work must be done before final conclusions can be reached. Particular attention, therefore, is being paid to two aspects in 1957. Firstly, the state of breeding is being studied at different experimental sites to see whether any young are successfully fledged between successive nest destruction dates. This is being done by a series of fortnightly examinations during July and August of the pigeons' breeding state, in selected habitats. This should show whether the right interval between the two successive periods of

FARMING AFFAIRS

nest destruction is being used. Secondly, the starting date of nest destruction is of importance, and to discover the best date on which to begin, a study is being made of the breeding season of the wood-pigeon in two widely separated regions. In north-west England, the breeding season in Cheshire, Lancashire and Shropshire is being studied, for comparison with that of eastern England (East Suffolk, Norfolk and Lindsey, Lincs). This work is intended to supplement the data on the breeding season already obtained in Cambridgeshire in 1955 and particularly to discover whether regional variations exist and, if they do, whether they are likely seriously to affect the date on which nest destruction should begin.

Until this further experimental work has been completed, no final conclusions can be reached on this method of controlling the wood-pigeon.

R. K. Murton

Tractor sense

Not only winter brings its problems. Conditions in summer can also lead to inefficient working and quick deterioration of the tractor, unless knowledgeable precautions are taken. The greatest danger comes from dust. Every gallon of fuel used in the tractor engine needs 10,000 gallons of air for combustion, and this volume of air sucked in from the atmosphere over a dusty field can contain enough abrasive matter to cause very serious engine wear. True, the facts are not quite as bad as this picture might indicate, because not all the dirt that enters the cylinders of the engine ends up where it can cause abrasion. Some of it mixes with the carbon products of combustion and swells the deposit which accumulates on piston tops and in combustion chambers. And a certain amount of dust may be blown straight out through the exhaust valve. But some is bound to find its way into places where it will be harmful. Besides abrasion, dirt can cause trouble indirectly, by blocking oil ways.

For these reasons, the air cleaner on the tractor must be attended to much more frequently in the summer, and the oil filter element should be changed more often during the dry part of the season. If the pipes connecting the air cleaner and the intake manifold are not quite free from leak, dirt can by-pass the cleaner. Dusty air can get in also through a defective gasket on the intake manifold, or through gaps due to loose clips on the hose from the air cleaner.

When running repairs to the engine in the field involve dismantling bearings or other parts which must be kept free from dust, even more care must be taken in summer than winter. The same is true even of topping-up the engine with oil. The can used for transferring the oil to the engine must not be left where it can pick up dirt; keep it in a box, or clean it out very thoroughly after use. It might be said that any grit that gets into the lubricating oil will be immediately arrested by the engine's oil filter, but this will not happen where the engine has the kind of filter which, at any given time, is treating only part of the oil circulating. Nor is it true of the overhead valve engine in which the filler cap for the engine oil is in the valve-rocker casing. In this type of engine, the oil flows over the valve-rocker mechanism before it gets into the sump, and it is undesirable that any grit shall be deposited on its way.

Driving wheel traction troubles are rare in summer. Occasionally a pneumatic tyre will fail to grip on a very dusty light soil, but it does not dig itself

in and the tractor can usually be restarted quite easily. But dry gritty soils can cause quick wear in pneumatic tyres if the tractor is over-loaded at the drawbar, so that slight slipping of the wheels occurs.

On the hottest days, the radiator can get over-heated, but this is rare and usually indicates that the engine is in poor condition or that the level of water in the radiator is too low.

H. J. Hine

Country Industries Exhibition

Londoners have had a splendid opportunity of seeing something of the variety of country crafts which, thanks largely to the help of the Rural Industries Bureau, flourish in the countryside of England and Wales. I refer to the excellent 14-day exhibition, staged by the Bureau at Holland Park, Kensington, which was opened by the Minister of Agriculture on 31st May.

Here was a stimulating and informative shop window of the kind of crafts which are being encouraged, with such good results, by the Bureau—from brick-making to basketry and boat-building, from wheel-wrighting to wrought-iron work, from furniture to farriery. The roots of these crafts are deep in English rural traditions, but the present vigorous flowering has come from reorientation in terms of modern equipment and a mid-twentieth century outlook. The latter connotes a strict watch on the economics of the business, so that today, properly kept records and accounts are recognized as a basic requirement in building up a thriving business.

Every farm tractor that goes on to the land means fewer horses and therefore less demand, for example, for black harness, but the present heavy demand for brown saddlery for riding horses and for domestic leather goods is providing a market which the country workshops are seeking to help fill. And greater farming mechanization calls for modern repair shops, ready on the spot to deal with oxy-acetylene and arc welding, flame profiling and drilling.

New horizons are lifting for country craftsmen who, as Mr. Heathcoat Amory said, have an essential part to play in a prosperous countryside. But more apprentices and journeymen are required. Is it too much to hope that this exhibition may, by the very quality of the work displayed, encourage some of our younger townspeople to train as rural craftsmen?

The leaflet describing how the Rural Industries Bureau is helping country workshops deserves to be widely read. The Secretary (at 35, Camp Road, Wimbledon, London, S.W.19) will be only too pleased to send one free of charge.

The Farm as a Business

Farmers nowadays have to pay as much attention to the economic organization of their farms as to the technical processes of growing crops and rearing stock. To help them improve their management, the Ministry has just published a second edition of that popular handbook *The Farm as a Business*. Besides basic information on management and up-to-date techniques of analysing farm business, one of the features of this publication is that actual farm cases have been used in illustrating the method of analysis of accounts and records. It is priced at 7s. (7s. 6d. by post) from H.M. Stationery Office or through any bookseller.

In Brief

POINTS ON GRAZING

M. André Voisin, who farms in Brittany, manages to get nearly three tons of starch equivalent per acre from his permanent grass—that is three or four times as much as the average here. Timing is the key. Grazing is limited to 4-6 days, so that the stock go over the area only once during each grazing period. Resting periods are varied according to the time of year: 14-18 days in May, 20-25 in June to early July, then 28-35 days from the end of July to September, and correspondingly longer periods in the autumn and winter. Compared with short rest periods, this system has given double the total green matter, more than double the starch equivalent and 40 per cent more crude protein.

From the Rowett Research Institute, it appears that when dairy cows are grazing good pasture in spring and summer, supplementary starch feeding, intended to balance the relatively high protein content of the herbage, is in fact unlikely to be economic. Using dried molassed sugar beet pulp, or flaked maize, returns were no better than the equivalent of 1 gallon of milk from 30 lb of supplement. Feeding a high energy supplement, such as flaked maize may, however, be of value in bringing up the level of solids-not-fat.

CHECK-OVER FOR GRAIN DRIERS

Before the grain driers are marshalled for use in the coming harvest season, time will be well spent to ensure (as far as humanly possible!) that they don't let you down half way through. Remove all dust, straw, or other rubbish which might foul elevators, fans or hopper shutters, and clean the inside of the drier and ducting thoroughly. Turn each moving part by hand to ensure that it is running freely and grease and oil the fan and elevator bearings.

In the case of a continuous drier, check the speed of the fans with a revolution counter to see that they are running at the speeds specified by the makers, and make sure that the mechanical elevators are running in the right direction.

To get even drying, it is essential to check the rates of discharge from the drying compartments to see that they are all the same. Fill the drier to the top of the grain compartments and then cut off the grain supply to the elevator. The plant should then be run, without a fire, and the level of the grain in each column marked periodically as it falls. The grain levels should fall at exactly the same speed in each column, and the discharge mechanism should be adjusted until they do. It is advisable also to check the discharge rate at various settings of the control. The rate will probably vary with the type of grain.

The walls of ventilated silos should be examined and any cracks filled to prevent air leaks; the air ducts of platform driers for bagged grain should be swept out very carefully before work begins.

FORESTRY ON THE HILLS

More vigorous planning to integrate forestry and farming in the hills is urged by the Government's Natural Resources (Technical) Committee in its latest report, *Forestry, Agriculture and Marginal Land*. Britain has a smaller proportion of its land under forest than any other country in Europe and has, in consequence, to depend upon overseas supplies for 85 per cent of its timber, which costs us as much as £430 million a year.

IN BRIEF

A good deal of upland and hill land which has been cleared of its original forests has since declined in fertility, due largely to overstocking and reduced farming prosperity in these areas. In the opinion of the Committee at least another 4 million acres of poor hill land could be afforested with advantage, but to meet the inherent difficulties in the situation *vis à vis* farming interests, it is recommended that more thought should be given to establishing small plantations in the form of shelter-belts.

LOCUSTS IN THE SUDAN

In the fight against the locusts in the Sudan, the Sudanese locust control has used up 7,750 tons of poisoned bait and employed an extra 350 vehicles in work which may influence the effect of locusts on East Africa later this year.

The Director of the Desert Locust Survey has said that this was international work of direct benefit also to East Africa and may settle whether or not East Africa got locust swarms towards the end of this year.

According to Dr. R. C. Rainey, of the Desert Locust Survey, the basic problem of locust control is one of dealing, at source or subsequently, with large, mobile insect populations, at times of the order of 100,000 tons of locusts, travelling distances often of the order of 1,000 miles in a few weeks, and each with a daily food consumption of the order of its own weight of plant material. For effective control, the main operational effort has accordingly to be made hundreds of miles outside the crop areas to be protected, under conditions often severely restricting the choice of control materials and methods.

World Crops

TO SELL MORE MILK

The Milk Marketing Board are re-opening their Registration Scheme, for members in England and Wales, of the Milk Bars Association of Great Britain and Ireland. The scheme, which originally started before the war, ceased to function when conditions prevailing during and immediately after the war deprived the milk bars of supplies of milk.

The Registration Scheme is voluntary and open to members of the Association, and its aim is to encourage milk bar proprietors to sell more milk by featuring milk, milk drinks, milk soups and other milk dishes more strongly and attractively in their establishments.

Experience gained by the Board during the last two years, at hundreds of milk bars operated at shows and exhibitions, has revealed a growing popularity with the public for this kind of service, and it is felt that with increasing national publicity for milk, the time is now ripe to take this further step towards improving and extending the service of milk drinks under conditions that are both hygienic and comfortable.

The Scheme will be operated by the Board, who will issue a Certificate of Registration and a badge for display by the registered member.

REFLECTION

Land is a mirror of character. Land in good heart is the reflection of thrift and patience, just as weeds, disease and deserts are indices of greed, neglect and ignorance. For this reason, the development of agriculture is not simply a matter of "know how". The aids that science has put into our hands do not alter the fact that a farm is an image of the farmer himself. By the same token, it is a likeness of the age in which he lives.

The Financial Times

Book Reviews

WSB X
Windmills and Millwrighting. STANLEY
FRESE. Cambridge University Press.
25s.

Today the windmill is no more than a picturesque survival. Ancient purpose has failed and the "grinding rumble and swish of sail" have ceased. But the abandoned towers still bear witness to the skill and success of our forefathers in the conquest of drudgery. Indeed, the harnessing of a force so variable, powerful and treacherous as the wind was a major industrial triumph and the line of mastery runs without a break from the windmill by way of the steam-engine to the atomic power-station.

Mr. Freese begins with a brief and incomplete history of his subject. He tells us nothing about such famous sons of millers as Constable and Austin, the one typifying the skill, the other the independence of their fathers' trade, though he makes clear by implication the debt of the Agricultural and Industrial Revolutions to the technology behind the windmill. Meikle, who designed one of the best early threshing-machines and gave the young Rennie his first lessons in engineering, was a millwright. So were Smeaton and Cubitt, while Murdoch, a millwright's son, invented the D slide-valve as well as cast the first iron-toothed windmill gears.

However, his account of "the living windmill" and of the materials, tools, design and craftsmanship which made it so effective a machine is masterly. He has made a passionate hobby of windmills for many years, he is experienced in repairing as well as recording them, and he has produced a thorough, detailed engineering study. Sentiment is certainly there, but it is kept in its proper place. You could build and run a mill from Mr. Freese's descriptions—indeed, at times you want to do so. There is a particularly fine word-picture of a mill coming to life as the sails catch a rising wind. What a valuable word-picture, too, for within the next generation there will be no man left who has felt an English mill roll and sway beneath his feet like a ship at sea, or heard the rhythmic clatter of the damsel and the rattle and bang of the sacks going up to the top of the mill.

The book contains a glossary of technical terms and is generously illustrated with photographs and engineering drawings, including a fine sectional drawing of Brill Mill. But there is no bibliography. If there were, it would show that this book covers of much the same ground as Mr. Wailes' *The English Windmill*, which was published only three years ago. It would not, however, show that another book of this type and standard is unnecessary. There cannot be too much of a good thing.

N.H.

The Bird Watcher's Reference Book.
MICHAEL LISTER. Phoenix House. 45s.

The author has set out to provide a source of explanation of, and reference to, some of the "background" subjects which impinge upon bird watching. His choice of subjects has depended upon their relative usefulness to the bird watcher, particularly the amateur, and also on the shortage of other accessible literature. As a result, he deals with the description and classification of habitats and the factors responsible for them, the weather, and writing a scientific paper. He also includes a world-wide directory of ornithological institutions, a 700-word glossary of terms (with French, Dutch and German equivalents) and a six-page list of references to the subjects treated in the text.

For many, the greatest value of the book will lie in the directory, which seems to be both comprehensive and up to date, and draws together a large amount of information never presented before in one volume. The definition of terms in the glossary is not always adequate or accurate. The author has cast his net wide, perhaps too wide; "biogeny" and "panmixia" are words which very few bird watchers are likely to meet or need. On the other hand, some important biological terms often used in connection with birds, such as "census", "predator" and "irruption", are left out, and, more surprisingly, he omits some mainly ornitho-

BOOK REVIEWS

logical terms such as "preen", "mob", "peck order", and "neognathous".

The chapters on weather, writing a scientific paper, and habitats are clear and practical, but it is a pity that so few of the "key" plant species are actually described for identification in the chapter on types of British vegetation. Also, there is no mention of any standard flora by which the amateur can identify these species. In a book like this I feel that space should have been found for a few more subjects, such as physiology and statistics, about which many bird watchers know too little.

M.G.R.

The publication of the White Paper "Long Term Assurances for Agriculture" suggests that the nettle of amalgamation, which had to be dropped at Yetminster a few years ago, will now be grasped more firmly. This pamphlet lends timely and powerful support to what has already become official policy.

Copies of the booklet may be obtained from Political and Economic Planning, 16 Queen Anne's Gate, London, S.W.1.

B.E.C.

Agriculture and Land-Use. Political and Economic Planning. 2s. 6d.

The P.E.P. publications have earned a reputation for their objective and broad-based approach to current problems, and their latest booklet is no exception. Its fourteen pages contain an admirably concise analysis of a fundamental problem of British agriculture today.

Basically, the problem is one of new wine and old bottles. Within a physical framework, often hundreds of years old, the industry is struggling to adapt itself to the opportunities of new techniques on the one hand and the challenge of labour shortage and competition from abroad on the other. Farms are too small, layouts unsuitable, and buildings often archaic. This is what the report describes as "the fundamental weakness" of British agriculture.

The consequences are that costs of production tend to be higher in this country than they are abroad, and subsidies amounting to about £250 million a year have to be paid from the public purse to maintain a prosperous agriculture. In the interests both of the nation, and of the industry itself, this huge bill must be reduced: the authors show how this can be done. British farms must be remodelled to fit mid-twentieth century conditions instead of those of the pre-mechanized age. Amalgamation of smallholdings, revision of farm boundaries and improvement of farm buildings—these are the signposts on the way back to solvency, and the remarkable success of the Swedish policy of amalgamation shows that it can be done.

Dry Stone Walling. F. RAINSFORD-HANNAY. Faber. 21s.

The dry stone waller or dyker, by the nature of his job, must spend most of his working hours well out of range of journalists, the interested public, and serious enquirers. Partly for this reason, his is one of the least documented of rural trades—or was so until the publication of Col. Rainsford-Hannay's manual on the subject.

If dry stone walling were nothing more than a gradually dying art there would have been plenty of justification for a book recording the methods involved and their local variations. The author, however, shows quite clearly that the stone dyke has several features against which wire fencing, for all its apparent cheapness, cannot seriously compete, chief among which is the unique shelter it affords to early lambs. Beside this, it has the advantage of being fireproof, self-draining, permanent, and most economical to erect where outcrops of stone make post-hole boring impossible.

Col. Rainsford-Hannay has been one of the most enthusiastic pioneers of the revived interest in this craft. Since his book summarizes what it has taken many generations of practical men to discover, it is important that those responsible for the upkeep and rebuilding of stone dykes should possess a copy. The early specifications tracked down and published by the author will at last give landowners, estate agents and farmers a sound criterion, and as the future of this particular skill depends as much on the client as on the craftsman, they are probably as important as anything else in this excellent book.

D.T.

BOOK REVIEWS

The Herdsman's Book. KENNETH RUSSELL. Dairy Farmer Books. 15s.

As the quantity and quality of animal products and the demands for their economic and efficient production steadily increase, so the demands on farm management and stockmanship also mount. Fortunately, the results of experience and experiment are always accumulating and becoming available to incorporate into day-to-day practice on the farm, though the incorporation sometimes proceeds rather more slowly than those who hope for active advance in agricultural efficiency could wish.

This book is designed to accelerate this spread of knowledge amongst all those whose job it is to tend our dairy and beef cattle. As the author states, the purpose of the book is to provide a code of good practice for the guidance of such herdsman, and there is no doubt that in this clearly-written, up-to-date and practical text he has achieved his purpose.

The book includes chapters on feeding for milk and beef, on the principles of grazing both herbage and kale, on the art and science of milking, on preparing food and washing up (including sections on clean milk production), on calf-rearing and feeding after weaning, on herd health, and on rearing and managing bulls. There is also a chapter on the showing of cattle.

A modicum of background knowledge is assumed, but the book gives a notable amount of basic information of a practical kind, and precise detail is given where this is required. Along with the facts, data and advice pertinent to the daily work of the modern herdsman, there are descriptions of quite recent developments in cow-house technique and of various practical devices to save time and unnecessary labour. Most of the difficulties likely to be encountered by the herdsman are dealt with, but there are two rather surprising omissions—little is said about the control of the compositional quality of milk and nothing about grass tetany, both problems which are worrying many herdsmen today.

The author's mature experience and wide knowledge of what is probably the most difficult task on the farm—the successful management of highly specialized livestock—illuminates the argument throughout. The book's value, however, is not confined to the herdsman alone; there is no young farmer and, in fact, there are few older farmers concerned with milk or

beef production who could not read it with advantage, and it would not be without usefulness to the advisory officer.

H.D.K.

The Dairy Farmstead: An Enquiry into the Layout of Dairy Buildings. I. G. REID and J. DOMINY. University of Reading. 3s.

Here is a methodical approach to underlying principles—to the economic considerations of saving labour by shortening the walking and carrying distances in dairy work. The enquiry covered three sizes in cowsheds (for 15, 30 and 60 cows) and, for each, five different positions for the foodstore and dairy in relation to the cowshed.

Although the varied layouts and walking statistics take a good deal of study, the conclusions are easily understood. The most thought-provoking of these is that an alteration in work routine will often give greater benefit and economy than a change in layout. Other conclusions reached were that the provision of a feeding passage is desirable in nearly every layout; for a 15-cow shed, the dairy and foodstore are best sited at the same end, but for larger sheds (30–60 cows) the dairy should be set centrally on the side, and this is also a good position for the foodstore. Provided a trailer is used daily and the main store is within 200 feet, a subsidiary foodstore at the cowshed is not necessary.

An important practical issue is whether labour saved by improvements in layouts or routine can be put to other profitable use; the authors suggest that the solution may be to increase the number of cows to suit the labour already employed.

A detailed study of twelve dairy farms emphasizes the amount of unnecessary work done in carrying and cooling milk; criticism is also made of the distant siting of Dutch barns, but fire risk is not mentioned as a reason for this.

Part II of the report details economic consequences of changes in two farm layouts. A change from cowshed to out-wintering (on free-draining land) and a milking parlour enabled 44 cows to be milked in the same time as had been taken previously for 25, and man-hours per cow were more than halved, without any fall in yield per cow. At the second

BOOK REVIEWS

farm a change from cowshed to covered yard and parlour milking had little effect on farm profits but it had some indirect advantages.

The practical conclusions of this study deserve to be widely known and applied.

R.G.S.

ness of a good text-book, is very well illustrated and free from bias in its approach.

E.H.

X⁰ **Crop Drying, Barn and Storage Machinery.** J. A. C. GIBB. Temple Press. 18s.

The changes brought about in British farming during the last two decades have greatly increased interest in the fixed equipment on the farm. This book will therefore be welcome to the farmer, while the student will find it a useful introduction to the more specialist scientific sources.

Starting with a survey of the whole range of barn machinery, and types of prime movers which can be used to drive this machinery, the book proceeds to deal with the principles and problems of crop drying, the sources of heat, the various types of grass, hay and grain driers, and the measuring equipment needed to control the drying process. The main aspects of selection, operation and management of the equipment, and the design features and working principles, are discussed. Selection of suitable equipment is facilitated by the comparison of individual machines or different working arrangements. Information is given on approximate initial and operating costs, fan outputs, drier ratings, power and heat requirements, fuel consumption, temperature and humidity control, and other factors. The sections dealing with the layout, construction and cost of the driers, and of the buildings needed for them, will also be found useful.

Since individual conditions and requirements vary considerably from farm to farm, the information presented is likely to be adequate for most purposes, leaving the reader to work out more detailed specifications in consultation with the makers of the equipment, or by reference to sources indicated in the extensive classified bibliography. The inclusion of a glossary on equipment for crop drying, barn and farmyard machinery, based on the British Standard 2468:1954, is to be highly commended.

The book contains much useful information, it is presented with the concise-

X **A Textbook of Dairy Chemistry. Volume 1—Theoretical** (3rd Edition). E. R. LING. Chapman and Hall. 21s. #330812

Dairy science has made much progress since the publication, in 1944, of the last edition of this book, and all sections of the new edition have therefore been revised and many of them enlarged. The description of this volume as "theoretical" may be misleading; the term serves solely to distinguish it from "Volume 2—Practical", which describes methods of chemical analysis. In fact, the book is most readable because the author explains the practical importance of his many facts and data. The whole treatment is, as it was intended to be, simple. Much of the subject-matter can be appreciated by those with little, if any, knowledge of chemistry, but the appropriate formulae and equations are given, as are references to the original scientific literature.

Eight comprehensive chapters include: a very good account of the chemical properties of the many constituents of milk; the quantitative composition of milk and its variations; the effects of heat on milk; the nutritive value of milk, cream and butter; rennet action; cheese varieties and cheese ripening; condensed milks and milk powders; the action and types of dairy detergents; and of many other relevant subjects.

The virtually new chapter on the composition of milk deserves special mention. Coming at an appropriate time, when compositional quality is receiving increased attention from all sides of the dairy industry, it ably summarizes present information on the composition of our milk supplies and discusses the trends therein, the legal aspects, and the influence of breeding, feeding, age of cow, stage of lactation, season, etc.

This revised edition is strongly recommended to all who are interested in milk and milk products. Students taking courses in dairying and agriculture and those engaged in the various advisory and technical branches of the dairy industry will find it of great value.

S.J.R.

BOOK REVIEWS

Museum of English Rural Life Report, 1956. University of Reading. 1s.

A study of the report shows that although this interesting and unusual museum was only recently founded by the University of Reading, it is already getting into its stride. The collections have been expanded by accessions, many of which are of considerable importance, and the general activities of the museum and its staff are increasing.

Though material illustrating the history of agriculture appears to be a major interest, other aspects of country life are brought out in the temporary exhibitions which are based on the museum's reserve collections and collections on loan from other museums. Last year, new exhibits dealt with the work of the old Board of Agriculture, the craft of the stonemason, and artificial fishing flies. Temporary exhibitions illustrated eighteenth-century gardening, Welsh woodwork and textiles, and the specialized forms of netting, lining and trapping used on the River Severn. The exhibitions for 1957 will include one on eighteenth-century cattle and sheep breeding, and another on the rural origins of cricket.

A most useful account of methods of cleaning, repairing and preserving wood, metal and leather exhibits is given in detail.

Copies of the report are obtainable from The Keeper, The Museum of English Rural Life, 7 Shinfield Road, Reading, Berks.

A.J.L.L.

World Wheat Statistics (1957 issue). International Wheat Council. 20s.

In this, the third issue of *World Wheat Statistics*, all the more important statistical data on wheat are given for the period 1949 to April 1957. The tables cover such aspects of world wheat economy as production, trade, supply and distribution in exporting countries, prices and ocean freight rates. Prices are expressed in U.S. dollars, and statistics of volume or quantities are given in metric tons, but conversion tables are appended.

Copies are obtainable from the International Wheat Council, Haymarket House, Haymarket, London S.W.1.

Books Received

Farm Machinery (5th Edition). C. Culpin. Crosby Lockwood. 35s.

Rothamsted Experimental Station Report, 1956. 10s.

Annual Report of the National Federation of Young Farmers' Clubs, 1956. (Obtainable free from the Central Office of the Federation.)

British Trees: A Guide for Everyman. Miles Hadfield. Dent. 30s.

Finance for Farmers and Growers, 1957. Martins Bank. (Obtainable free from any branch of the bank.)

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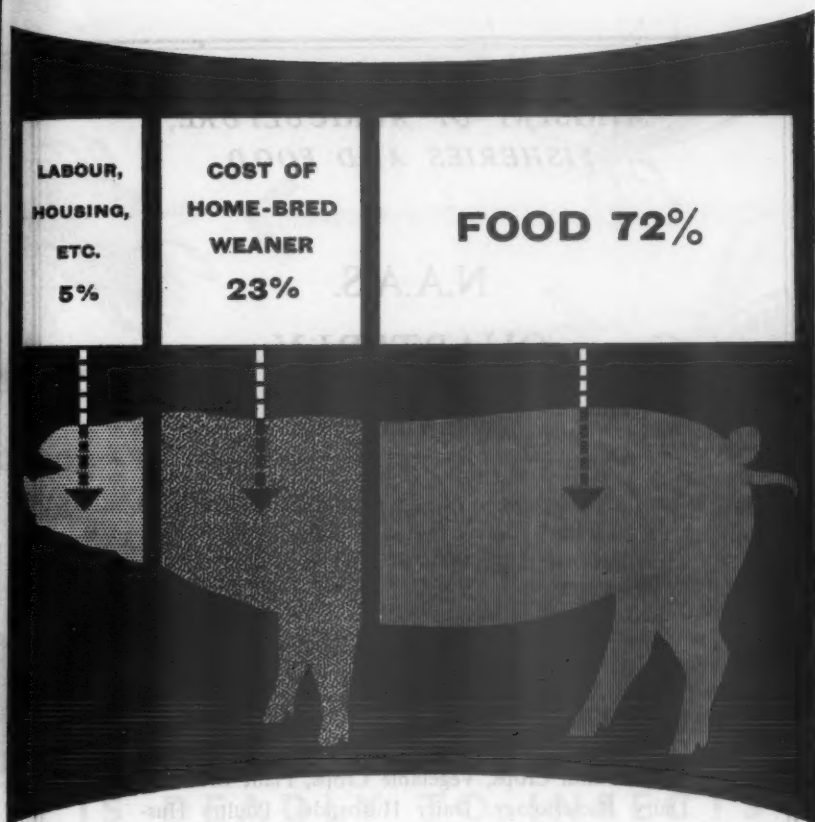
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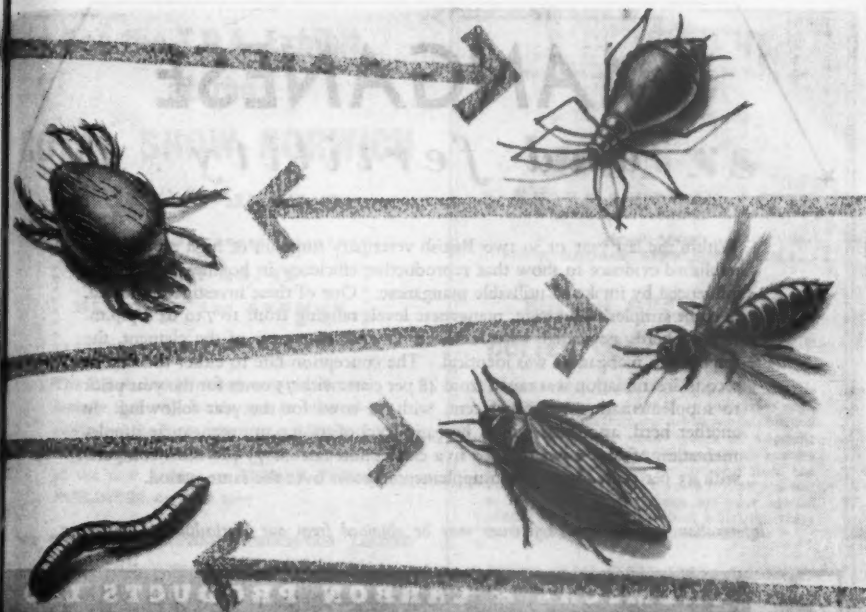
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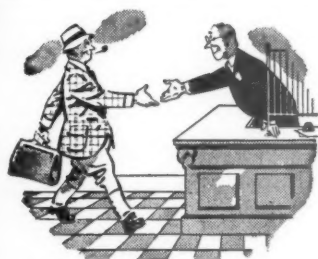
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